AVIATION WEEK

OCT. 13, 1952

A McGRAW-HILL PUBLICATION

50 CENTS

Sure footing for the "*Cutlass*"

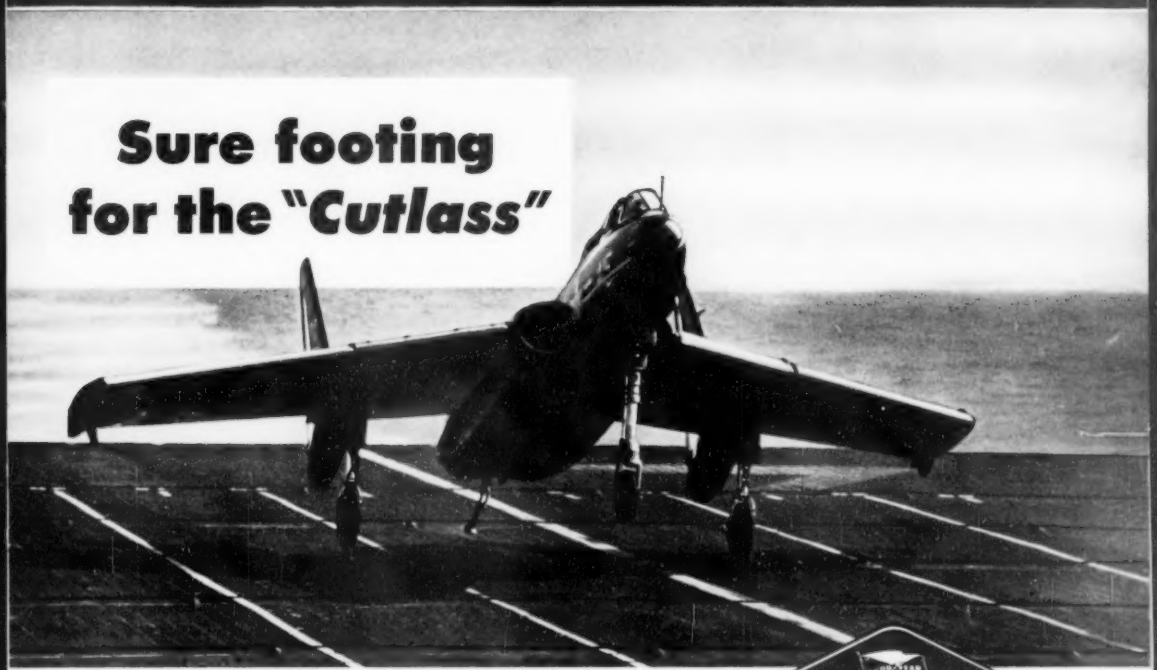

Photo courtesy U.S. Navy

First-line U.S. Navy shipboard jet, the Chance Vought "CUTLASS" relies on Goodyear landing equipment for safe, sure stops.

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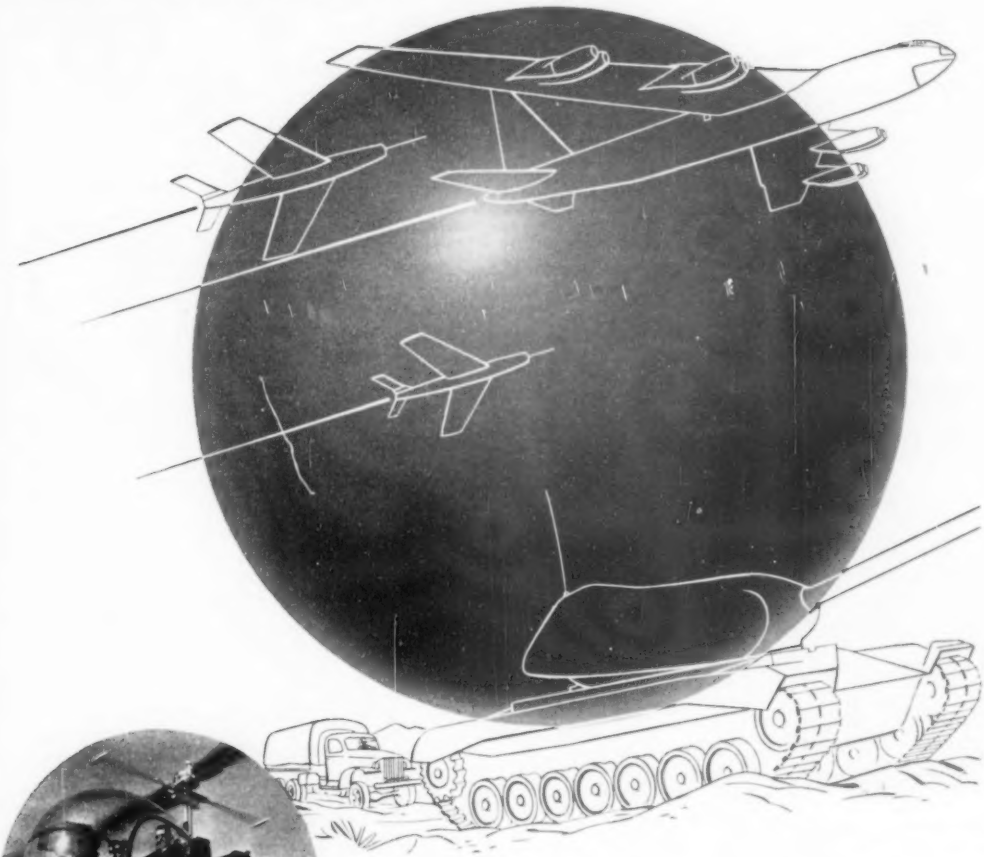

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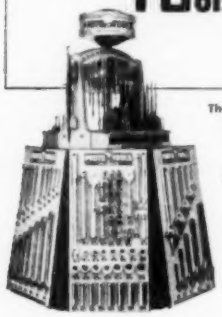

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Aviation Week

ABP Member ABC

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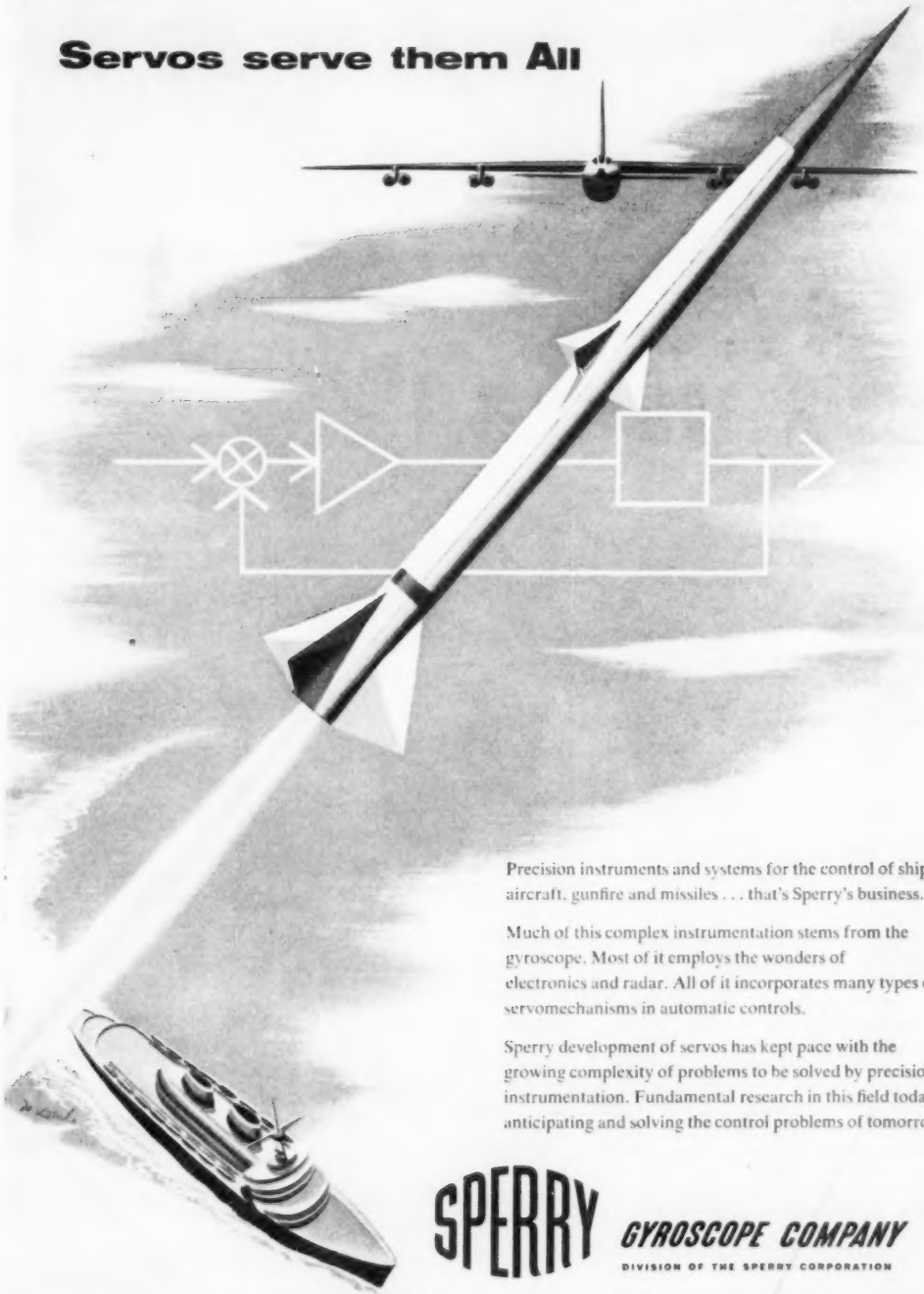

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NEWS DIGEST

Domestic

Mexico has accepted United States' invitation to reopen talks on a bilateral air agreement. Discussions aimed at reaching an agreement have been held off and on between the two countries since 1946 without success. Most recent meeting was last December. The new action undoubtedly resulted from the recent burst of proposed changes in the Mexican airline setup, including Mexico's recent certification of Eastern Air Lines to fly into Mexico from New Orleans if and when Mexican airlines were given equal rights in this country.

An increase to 70-80% in airlines' share of trans-Atlantic traffic by 1960, compared to the present ratio of approximately 35% is forecast by Air Transport Assn. In a long-range prediction, ATA's president Vice Adm. Emory S. Land said U.S. scheduled airlines should carry more than 45 million passengers over domestic and international routes in 1960, an increase of 84% over 1951. Jet aircraft in U.S. overseas operation is predicted for 1957-58.

Seaboard & Western Airlines has resumed trans-Pacific MATS flights via Wake Island. Carrier was forced to reroute its aircraft following last month's typhoon which disrupted all airline movements through the area.

Flying Tiger Lines began service on its big Navy Air freight contract Oct. 1. Tiger won contract from Slick Airways in bidding competition.

First over-the-top flight by Scandinavian Airlines System, via USAF base at Thule, Greenland (AVIATION WEEK Oct. 6, p. 14), will leave Los Angeles about Nov. 10, stopping at Edmonton, Alta., Canada, and Thule, Greenland—where USAF has just completed a new base. SAS hopes to start regular daily service over route next April.

Four Civil Aeronautics Administration and State Department officials are touring the Pacific to check up on U.S. responsibilities as civil aviation administrator. They are visiting Hawaii, Manila, Hong Kong, Bangkok, Tokyo and Alaska.

Pan American World Airways has signed a new labor contract in Guatemala enabling PAA to resume service there. PanAm flights to and from Guatemala were suspended July 21 when airline workers in Guatemala City struck. Employes will get two months' back pay to offset loss of income during strike.

Col. Augustus Post, believed to be the thirteenth man to fly an airplane in the U. S., died in New York Oct. 4 at the age of 78. It was Post who suggested that Raymond Orteig put up a $25,000 prize for a successful New York-Paris flight, and he wrote the rules for the contest. He was a founder of the Aero Club of America, and for 20 years its secretary. He was a noted balloonist in the early years of the century, in 1909 establishing with Clifford B. Harmon a duration record for free balloons of 48 hr., 26 min.

Civil Aeronautics Board investigators returning from the Apr. 29 PAA Stratocruiser crash site in Brazilian jungle report tail and rudder was five mi. from main wreckage "indicating that they had broken from aircraft in the air prior to ground impact." Furthermore, the undiscovered No. 2 engine and prop apparently must be even farther away.

Financial

Elastic Stop Nut Corp., Union, N. J., has declared 25-cent-per-share dividend on its common stock, payment Nov. 1 to holders of record Oct. 15.

Jack & Heintz, Inc., Cleveland, declared dividends on company's common and preferred stock last month. A 15-cent dividend will be paid on common stock Nov. 1 to holders of record Oct. 15. A 50-cent quarterly dividend was declared on cumulative preferred shares, 4% series ($50 par value).

Solar Aircraft Co., San Diego, will pay a 22½-cent-per-share dividend on its preferred stock Nov. 15 to holders of record Oct. 31.

TIME BOMB ripped gaping hole in fuselage of this Compania Mexican de Aviacion DC-3 while in flight. Bomb was placed aboard plane in suitcase. The pilot, luckily delayed 15 min. in takeoff from Mexico City, was over a military field and safely landed the crippled ship with 17 passengers aboard.

International

Four English Electric Canberra jet bombers and two Handley Page Hastings transports are scheduled to make an extensive tour of Latin America beginning late this month for "goodwill and courtesy and training."

Some 60 RCAF Sabre fighters are to fly the Atlantic to the RCAF's new fighter base near **Metz, France.** The three squadrons will represent the first Continent-based operational air units the Canadians are contributing to NATO defense.

Panair do Brasil plans to add another route, from South America direct to Hamburg, Germany, and may also extend service to the west coast in Chile, according to Dr. Paulo Sampaio, president of the carrier.

Addition of water injection devices to provide smoother engine operation will delay appearance of Comet planes on Honolulu-Australia run until mid-March, Canadian Pacific Airlines has announced. CPA expects to start weekly Comet service over route then, later upping schedule to twice a week.

BOAC will inaugurate Comet service London-Singapore Oct. 14, with seven stops enroute on the 7,761-mi. trip—Rome, Cairo, Bahrain, Karachi, Calcutta, Rangoon and Bangkok.

British Overseas Airways is still studying in-flight refueling of the Comet, but reportedly cannot use it in near future because of commercial cost of refueling stations; equipment and operation is prohibitive unless a big airline fleet is using the service along a particular route.

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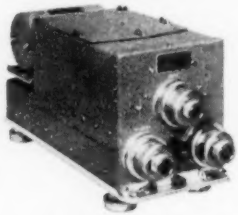

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AVIATION CALENDAR

Oct. 14-15—Fifth annual Airport Development and Operation Conference, Hotel Onondaga, Syracuse, N. Y.

Oct. 19-24—American Welding Society national fall meeting, Bellevue-Stratford Hotel, Philadelphia.

Oct. 21—Air Transport Section, National Safety Council, annual meeting, Conrad Hilton Hotel, Chicago.

Oct. 25-Nov. 2—International aviation and travel exposition, Navy Pier, Chicago.

Oct. 26—Los Angeles International Airport Air Fair and Open House, Los Angeles.

Oct. 28-30—Transport Aircraft Hydraulics System Conference, sponsored by Vickers, Inc., Hotel Park Sheraton, Detroit.

Oct. 28-30—AIEE Air Transport Committee annual meeting, Commodore Perry Hotel, Toledo.

Oct. 29-31—AIEE conference on machine tools, Ten Eyck Hotel, Albany, N. Y.

Nov. 6-7—National fuels and lubricants meeting, Society of Automotive Engineers, The Mayo, Tulsa, Okla.

Nov. 7—IRE symposium on microwave circuitry, Western Union Auditorium, New York.

Nov. 8—Annual Midwestern Tool Engineering conference, University of Illinois, Urbana, Ill.

Nov. 11-12—Piper distributors' annual meeting, Lock Haven, Pa.

Nov. 13-15—Acoustical Society of America symposium on aircraft noise, San Diego, Calif. (For details, write ASA, 57 E. 55 St., New York 22.)

Nov. 17-20—National Aviation Trades Assn. annual convention, Hollywood-Roosevelt Hotel, Los Angeles.

Dec. 2—Symposium on light-metal heavy forgings and extrusions for aircraft, SAE, ASME, IAS and AIME.

Dec. 2-5—Aviation Distributors and Manufacturers Assn. tenth annual meeting, The Kenilworth, Miami Beach.

Dec. 3-5—Society for Experimental Stress Analysis, annual meeting, Hotel McAlpin, New York.

Dec. 10-12—Joint AIEE-IRE-ACM conference on electronic computers, Park Sheraton Hotel, New York.

Dec. 17—Wright Bros. lecture to be presented by the IAS at 3 p.m., U. S. Chamber of Commerce auditorium, Washington, D. C.

PICTURE CREDITS

7—McGraw-Hill World News; 9—(top) Wide World; (center) Charles E. Brown; (bottom) Levy-Artof; 14—Kaiser-Frazer; 17—Boeing Airplane; 21-23—Bill Clinkscales; 30—Stephens-Wood; 31—(top left) David Anderton; (top right, center, bottom) Stephens-Wood; 32—(top) Stephens-Wood; (bottom) David Anderton; 34—David Anderton; 41-42—Consolidated Vultee Aircraft Corp.

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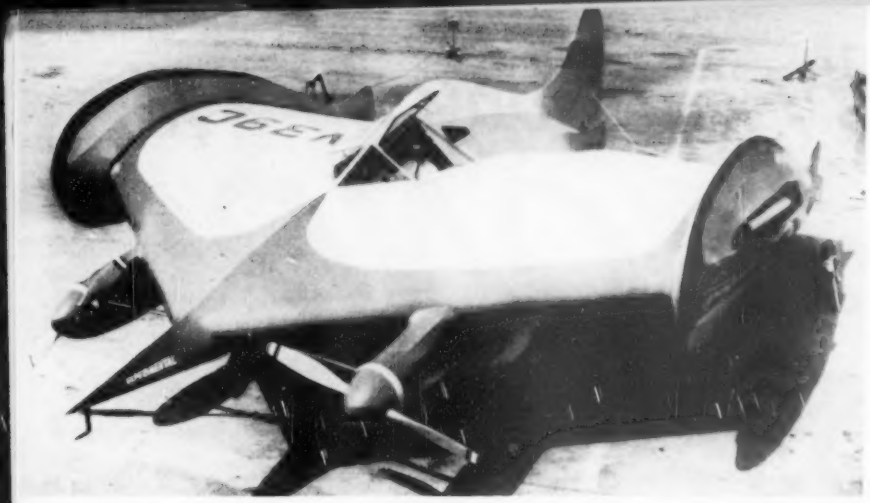
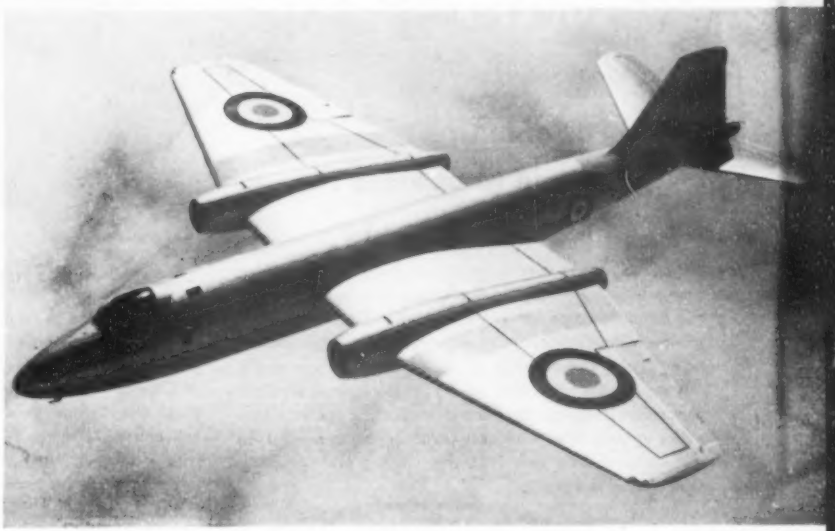


WINGLESS PLANE—This virtually wingless plane recently passed its first test when it rose ten feet off the runway during a trial taxi run at Santa Ana, Calif. In the cockpit is William Horton, an aircraft engineer, who spent 18 months and $50,000 building the plane. Horton said the craft is designed to prevent air surrounding it in flight from mixing with the air flowing over its lifting contour.

Aircraft Pictures of the Week



CANBERRA AS TRAINER—The wide bands painted on each wing and on the fuselage just in front of the tail indicate that this English Electric Canberra T. Mk. 4 is an RAF trainer. This craft will be used to train RAF crews for other types of jet bombers as well as for the bomber version Canberra.

RILEY TWIN NAVION—Here is the No. 2 prototype of the Riley Twin Navion now undergoing flight tests. In this latest model the nose has been redesigned and now houses a baggage compartment. Performance has been improved and plane is slightly lighter than its predecessor. It will be manufactured by Riley Aircraft, Fort Lauderdale, Fla.

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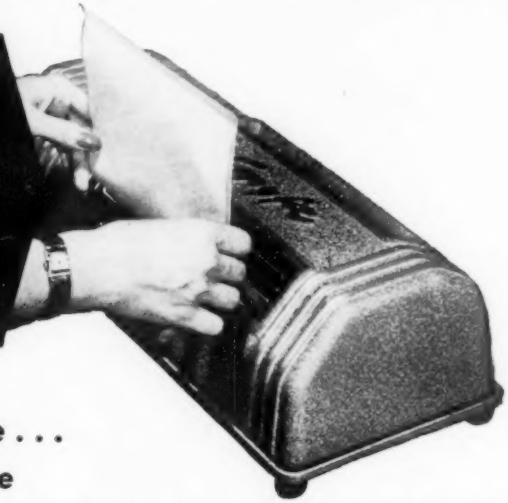

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WHO'S WHERE

In the Front Office

Barry B. Willis has been appointed a vice president of Grand Central Aircraft Co., Glendale, Calif. Willis had been company controller.

Robert A. McMillan has been named general manager of Los Angeles Dept. of Airports, succeeding **Adm. John W. Reeves, Jr.**, who resigned in July. McMillan will have charge of International and San Fernando Valley Airports.

Frank Rowell, Jr., has been named president of Guardian Electric Mfg. Co., Chicago, succeeding his father, the late **F. F. Rowell, Sr.** The new president was one of the firm's co-founders in 1932.

Changes

Carl E. Swanson has been appointed senior scientist for Engineering Research Associates, Inc., St. Paul, Minn., where he will supervise special projects for the electronics firm.

George J. Fischer has been designated general sales manager for Acroquip Corp., Jackson, Mich., and **Matthew J. Betley** has been appointed works manager.

Otto Janssen has been appointed spare parts sales manager of AiResearch Mfg. Co., Los Angeles.

Robert E. Morris has been named section manager in the application engineering department of Jack & Heintz, Inc., Cleveland.

Eric Ledin is new group engineer for cockpit design in Flightronic flight simulator division of Engineering and Research Corp., Riverdale, Md. **James E. Hays** has been promoted to group engineer for structures in the same division.

Ross N. Stevens, Jr., has joined Doman Helicopters, Inc., Danbury, Conn., as project engineer in charge of CAA certifications. **John J. Koyner** has joined Doman as production manager.

A. J. Redway has been named assistant to McDonnell Aircraft Corp.'s Dayton, Ohio, representative.

A. L. Chabot has been promoted to director of maintenance and engineering for the entire Eastern Air Lines' system.

Conrad J. Hemond, Jr., has been appointed engineer and project manager for Industrial Sound Control, Hartford, Conn.

Harry Slanta has joined Goodyear Aircraft Corp. as assistant manager of the tool engineering division and **Paul R. Herholz** has been named manager of the tool engineering staff department.

J. W. Woodward has joined R. M. Hollingshead Corp., N. J., as West Coast representative, replacing **J. W. Reed, Jr.**, who has been reassigned to the firm's Camden, N. J., headquarters and promoted to assistant manager of the Government Sales division.

Resignations

Sadi G. Sandoz has retired from Bellanca Aircraft Corp.'s engineering department after 25 years with the New Castle, Del., firm as designer, pilot and engineer.

INDUSTRY OBSERVER

► Despite official Air Force statements that increasing complexity of military aircraft is not an acute problem, at least six aircraft manufacturers in the United States, Britain and France are designing and building stripped-down lightweight interceptors aimed at eliminating all unnecessary complexity in combat aircraft. North American Aviation and Douglas have projects in the mill for the USAF and the Navy respectively. In England, Fairey, de Havilland and Folland are carrying the ball; in France, Dassault is working on a delta design to meet this requirement.

► **Both Vickers-Armstrongs and Hawker are planning advanced development of the Swift and Hunter interceptors; the Swift eventually will go to a crescent-shaped wing while the Hunter will continue with more sweepback up to 50 deg.**

► Hughes Aircraft's Falcon is currently specified by USAF as its standard air-to-air guided missile for the next generation of all-weather fighters and supersonic interceptors. The Falcon will have a maximum speed of Mach 3 using a solid fuel rocket for propulsion. Guidance will be internal using a target homing device. Falcons will be carried externally on the interceptors.

► **Technical observers were interested to note de Havilland's swift abandonment of leading-edge wing slats in the Comet as a method of improving low-speed flight characteristics of the swept wing. After initial flight testing on the Comet prototype, de Havilland switched to simple wing fences on all its production model Comets. This is the same solution to the same problem used by the Russians on the MiG-15 design. The F-86 still uses leading-edge slats.**

► U.S. safety observers in Europe are disturbed by reported policy of some European air forces in using civilian airliners as interception targets for jet fighters when no military target planes are available. Several fatal airline crashes have occurred in the U.S. from military fighters buzzing civilian transports.

► **Navy deferment of plans to make the Grumman S2F-1 twin-engine anti-submarine plane at the new dual-purpose General Motors aircraft-auto plant at Arlington, Tex., means more room there to assemble Buicks, Oldsmobiles and Pontiacs. Aircraft tooling will be put in readiness for quick start of an aircraft assembly line, if desired, Navy sources say. Meanwhile the production fate of the S2F hangs in the balance. Chances are it will never be built at Arlington.**

► Wing of McDonnell F-101, supersonic fighter developed from experience with XF-88 prototypes, is reported to be one of thinnest yet designed. Root thickness-chord ratio is 6% with reduction to a 4 or 4½% ratio at tip.

► **Foreign aircraft designers face a tough problem in the transition from 20-mm. to 30-mm. aircraft cannon. One company reports nearly 1,000 lb. additional weight chargeable to four of the bigger cannon in a single-engine jet fighter. Other groups show concern over the extremely long barrels of the three types—Aden, Hispano and Oerlikon—now in existence. French sources report a short-barrel design which should help the problem, but gun is still in design stage, has not been built or fired.**

► The Gloster Meteor shows up in another of its many flying testbed forms with French SNECMA Atar 101C turbojets installed. Work on the project was done by Air Service Training, Ltd., one of the Hawker Siddeley Group along with Gloster.

► **Jet-powered tanker version of the Boeing B-47 reportedly is scheduled to fly next February. Use of jet tankers will simplify fuel storage problem at supply bases, which will need to stock only JP-4 instead of both jet fuel and high octane gas used by present piston-powered refuelers. Jet tanker also will permit the jet plane being refueled to retain its altitude and speed, which it cannot do with a piston-powered refueler.**

Washington Roundup

One Month to Go

Top defense officials are putting their houses in order and awaiting the arrival of new tenants.

The Truman Administration's reign doesn't end until Jan. 20, but appointees of the President-elect for the top defense posts—Secretary of Defense, director of the Office of Defense Mobilization, chairman of the Munitions Board, and, possibly, the three service secretaries—are expected to assume their posts shortly after the Nov. 4 election.

• **Secretary of Defense Robert Lovett** was first to propose this course. Work on the 1954 fiscal year military budget, expected to approximate this year's $46 billion, is on schedule and due for submission to Lovett Oct. 23. The services will have a brief three days in which to rebut actions taken by the Secretary's staff. The department's proposed budget is due for receipt at the White House Nov. 1.

The logical course from this point, as Lovett has pointed out, would be for Defense to rework the 1954 budget under directions from the President-elect and in collaboration with the next Administration's secretaries who will have to explain and defend it before congressional committees early next year.

• **Mobilization Director Henry Fowler** has followed Lovett's suit and urged that his successor, too, be named right after the November election for an initiation period before Fowler quits Dec. 31.

Continuation of the ODM-DPA-NPA mobilization organization is doubtful, though.

The likelihood seems to be that Ralph Trigg, career government official now deputy director of Defense Production Administration, will take over the post when Fowler leaves, for a stop-gap period while the future of the agencies is determined.

• **Munitions Board Chairman John Small**, who, after a long fight, recently was made "czar" over military production, is ready to leave now.

The board is currently reviewing all service supply regulations—the first step toward implementation of its control over all aspects of military procurement and production.

Defense Money and Politics

Watch for Truman to put Eisenhower on the spot regarding cuts in defense appropriations on the eve of the election.

According to word reaching the Pentagon, the President will make a public announcement on Defense Department's request for its 1954 fiscal year budget. It will have the backing of Secretary Lovett, a Republican, as well as the top military command.

Regardless of Eisenhower's response, there will be an Administration comeback:

• If Eisenhower challenges the budget as being too high, Truman can repeat his charge that the Republican candidate, indulging in "irresponsible politics," wants to "impair our security, in fact, wreck it"—over the advice of top military advisers.

• If Eisenhower essentially supports the budget, he would, of course, have to swallow his assurances of tax cuts through reductions in defense spending.

In other years, the budget has been a well-kept secret until submission to Congress in January.

Defense Dept. Reorganization

Regardless of the election outcome, a major reorganization of Defense Department seems certain.

Candidate Dwight Eisenhower has called for it; Secretary Lovett is making a study and will lay his recommendations before the new Congress in January.

There seems to be general opinion that reorganization ought to move in two directions: (1) greater civilian control and (2) more unification, further curtailing the authority of the three services.

Some proposals being considered: strengthen the top policy-deciding Security Council; remove the Joint Chiefs of Staff from service commands and make the group purely advisory to the Secretary of Defense; increase the control of the civilian service secretaries by requiring that all orders to commanders be submitted through them, rather than through the Chiefs of Staff.

Materials Outlook

Although most business men feel that the Controlled Materials Plan can be ended early next year, Defense Mobilizer Fowler says it will be needed up to June 30.

Fowler's report on the materials situation:

• **Steel.** The steel industry has recuperated rapidly from the recent strike. By Nov. 30, mills will complete shipment of all military orders for the April through September period. Delivery of all military steel allotments for 1952 by the end of the year "is virtually assured."

• **Copper.** Although still in tight supply, imports have made the copper picture "considerably brighter than at any time since Korea."

• **Aluminum.** Producers will shortly be invited to participate in another expansion of capacity by 200,000 tons a year due to an increase in estimated military requirement. This would bring output from 718,000 tons in 1950 to 1.7 million tons.

• **Ferro-alloys.** A "consolidated attack" program by several government agencies is being developed to build up a stockpile of ferro-alloys for jet engine manufacture.

World Air Traffic

In the scheduled field, U. S.'s slice of non-Communist world air traffic is now over 50%, except in cargo operation according to Air Transport Assn.

International Air Transport Assn. estimates of world air traffic for 1952:

• **Passengers carried:** 59% of the estimated 45 million passengers that will be carried on the non-Communist airlines of the world during 1952, 26,794,100 will be on U. S. carriers—local, trunk and international.

• **Passenger miles:** 54% of the estimated total of 27.9 billion passenger miles that will be flown, 15.1 billion will be by U. S. carriers.

• **Cargo ton-miles:** 33% of the estimated total 684.9 million cargo ton-miles, 228.3 million by U. S. lines.

• **Mail ton-miles:** 50% of the total 188.3 million ton-miles, 94.5 million will be by U. S. lines.

• **Revenue ton-miles:** 53% of the total 3.4 billion revenue ton-miles, 1.8 billion will be by U. S. lines.

• **Number of aircraft:** 54% of the total of 2,500 aircraft in scheduled operations in the non-Communist world, 1,357 are operated by U. S. carriers.

—Katherine Johnsen

AVIATION WEEK
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Off-Shore Buying Team Near Decision

- **Pentagon awaits report of industry-AF group.**
- **Nod is seen for Swift, Mystere 4, Fiat G.80**

By Robert B. Hotz

Paris—Final evaluation of European aircraft for the $400-million fiscal 1953 off-shore procurement program is now being made in Europe by a joint military-civilian team of USAF officers and U. S. aircraft industry specialists.

Civilian members of the evaluation team include jet engine specialists from General Electric Corp., airframe experts from Glenn L. Martin Co. and electronic technicians from Hughes Aircraft Co.

The evaluation team already has completed its study of British aircraft. Now it is scheduled to finish its European survey and submit its report to the Pentagon and to the Paris office of the U. S. special representative in Europe by the end of November. No aircraft contracts will be negotiated under the program until the evaluation team report has been submitted and approved.

Ambassador Fred L. Anderson, a former USAF general who is now deputy U. S. special representative in Europe, told AVIATION WEEK the broad outlines of the fiscal 1953 program had been approved by NATO and the United States. However, the details on quantity of types of specific aircraft would be subject to change depending on technical developments and production bottlenecks, he said.

▶ **Two Objectives**—The fiscal 1953 program, which has aroused opposition of U. S. aircraft manufacturers, is aimed at two objectives:

• **Making up** as soon as possible an acute deficiency in the NATO air forces in first-line interceptors and night fighters. It is estimated that a European production program of 2,000 fighters annually will be required in addition to U. S. and Canadian aircraft available for Europe, to bring the NATO air force fighter strength up to par both quantitatively and qualitatively.

• **Building up** the European aircraft industry to the point where it eventually can sustain the military requirements of the European NATO countries without continued large-scale technical and financial aid from the United States.

U. S. EVALUATION TEAM is headed up by Ambassador Fred L. Anderson (left), former USAF general, and Brig. Gen. Phillip Smith (right) former AMC procurement chief.

As originally planned the fiscal 1953 program called for the purchase of 1,700 fighter aircraft with a $400-million fund, of which $225 million would be contributed by the United States and $175 million by the participating NATO countries—Great Britain, Italy, France, Holland and Belgium.

▶ **Prospects**—Here is how the procurement prospects look now in each of the countries under consideration:

• **England.** The Vickers Swift interceptor is the only sure bet in the fiscal 1953 program as it now stands (AVIATION WEEK Sept. 22, p. 10). U. S. and British military evaluation of the Swift have given it a top rating and Vickers-Armstrongs' production facilities make it possible to get initial deliveries for the NATO air forces in 1953. Fokker is negotiating a license to build Swift airframes in Holland, with initial deliveries from the Dutch factory scheduled to begin by the middle of 1954.

Original plans called for Rolls-Royce, Ltd. to license the Belgian Fabrique Nationale to build axial-flow Avons for the Dutch Swifts, but it now appears doubtful that the Belgians will tackle the job. Present plans call for all Swift engines to be purchased from Rolls, which will soon have five major factories in production on the Avon in England.

The Belgians have expressed an interest in building Hawker Hunter airframes, but U. S. evaluation experts are not enthusiastic about the Hunter. It probably will not be included in the fiscal 1953 program.

• **Italy.** Original plans called for Fiat to build the de Havilland Venom night fighter and the Ghost Mark 3 centrifugal-flow jet to power it. However, U. S. experts feel the Venom in its present form is not the best bet for NATO night fighter requirements. The Ghost Mark 3 is not geared to drive a generator of sufficient power to operate modern airborne radar. A Ghost Mark 4 with a double generator is under development but it has not yet passed its type test. It appears unlikely it will be available for production until next summer.

In view of the rapid obsolescence cycle of the Venom and the delays on the Ghost Mark 4, serious consideration is being given substitution of an advanced version of the Fiat G.80 design to meet the night fighter requirement. Although originally designed as a two-seater jet trainer to comply with treaty limitations on the Italian aircraft industry, the G.80 can be readily converted to an improved-performance night fighter.

It would require an American axial-flow jet engine and an American type of airborne radar, both of which would have to be built in Italy under license. U. S. experts feel there is a good possibility of establishing the basis for a military electronics industry in Italy to meet an acute European need.

• **France.** Avions Marcel Dassault was assured the French portion of the fiscal

1953 program after NATO flatly turned down French pleas to include purchase of Nord transports. There is a sharp conflict between the French concept of off-shore procurement as a method of building up a "balanced" aircraft industry making everything, including transports and trainers, and the NATO concept of using the program primarily to make up its serious deficiency in first-line fighters.

Dassault is about ready to begin production of the Mystere Mark 2 powered by a 6,200-lb.-thrust axial-flow Atar turbojet; but U. S. experts are pressing for Dassault to go directly from its present Ouragan production program into the Mystere Mark 4 which has more sweepback in its thinner wing and is powered by a 7,200-lb.-thrust Pratt & Whitney J48 centrifugal turbojet.

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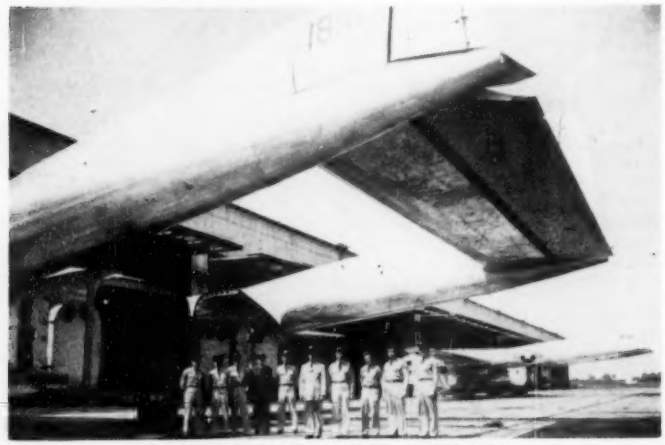
However, they admit Vickers and any other British firms involved in European licenses will receive their licensing fees from off-shore purchases on products developed with British government funds. The British government will pay the manufacturers these fees from its sterling contribution to the off-shore program.

The British stoutly defend their right to these fees and point to the U. S. MDAP arrangement in Europe as unfair commercial competition.

▶ **Price Factors**—One of the big arguments in favor of off-shore procurement is the price factor. For example: The Vickers Swifts being bought under the fiscal 1953 program cost $168,000 apiece or just about half the current price of an F-86 Sabre.

In addition to the $225 million being poured into the European aircraft industry in the fiscal 1953 program, the Mutual Security Agency and its predecessor, ECA, have given European nations $105 million in aircraft and accessories and many millions of dollars in machine tools for aircraft factories since 1948.



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Martin identified its new project as the Seamaster 275. No Navy designation for the airplane has as yet been announced.

The new Martin minelayer may also be adaptable for anti-submarine and patrol uses, and perhaps as an aerial-refueling tanker.

U. S. Airlines' Jet Transport Specs

Cost per ton-mile*	Equal to DC-6
Cruise speed	550 mph
Range, domestic	2,000 mi.
Range, international	3,200 mi.
Runway length, domestic	5,500 ft.
Runway length, international	7,500 ft.
Fuselage width, inside diam.**	128 in.
Cabin aisle headroom	80 in.
Passenger capacity, first class	70-80

* Direct cost operated at 20-30,000 ft. (necessary on shorter hauls or against adverse wind gradients) should be comparable with costs of existing types of the DC-6 and Connie series.
** The 128-in. cabin width must be constant (no taper) to make possible five-abreast seating for aircoach use.

SOURCE: Air Transport Assn.

U. S. Sets Jet Liner Sights High

ATA specs call for a transport with twice today's speed at no more operating cost; stress is on safety.

By F. Lee Moore

The Air Transport Assn. last week revealed its first detailed jet transport design recommendations for U. S. manufacturers. The airlines stress safety above all else, but they also ask almost double today's speed at no more than today's operating cost.

Economic specifications can be summarized as a ton-mile operating cost and range comparable to the DC-6 and Connie series of today. Despite having a cruising speed of 550 mph. or more, the plane must be able to operate safely on today's airports and airways.

▶ **Safety First**—Major safety items detailed in the ATA study include:

• **Fuel storage** must all be outside the fuselage—either in wings or pods or both. An interesting footnote urges that manufacturers find out for the airlines how much it would cost to enable the plane to refuel completely in 20, 15, 10 and 5 min. This may indicate that some airlines plan in-flight refueling to boost payload and range.

• **Landing gear housing** should be designed so that tire explosion could not damage lines, wires, critical structure or accessories. Gear collapse should not endanger fuel tanks and lines. The plane should be certified for landing in crosswinds up to 40 mph.

• **Pod powerplant.** "It is imperative that the engine installation . . . assure an advancement in the safety of the airplane with respect to fire over that provided in present transport airplanes. An engine fire should not jeopardize the airplane primary structure, adjacent engines, or airplane and engine controls."

This requirement indicates the airlines want individual engine pods suspended below the wing.

• **Control boost** may be acceptable, but the plane must be safe even if the boost fails.

• **Structure problem** most worrying the airlines is pressurization, since there is no previous experience in pressurizing so large an area as a commercial passenger cabin at altitudes of 40,000 ft. or more.

• **Deceleration devices** must all be self-contained. No external aids like arresting cords or drag parachute should be required. Anti-skid devices are desirable, but what the airlines wish for most would be a new device equivalent to reversible-thrust props.

• **Fail-safe maintenance.** The airlines ask that "systems and components be designed so that it is impossible for mechanical personnel to incorrectly attach and connect functional parts in cases where hazard can result from incorrect attachments."

▶ **Flyability**—Because almost no scheduled jet transport experience is available yet, "it would be optimistic to imagine that all operating problems have been anticipated. . . ." Therefore, the airlines urge the manufacturers to watch results of BOAC's jet Comet operation and any other jet transport research and test programs such as the "prototype testing" bills proposed by CAA.

Plane must be able to maneuver safely at low speeds despite failure of one engine in a two- or three-engine plane or failure of two engines in a four- or five-engine plane.

Non-flammable hydraulic fluid or else pneumatic (air) systems must be used.

• **Fire protection.** The airlines make 14 specific recommendations for improving fire protection over that available in present transports. These include pneumatic power, better fire warning, and various shutoffs and firewalls.

• **External lighting** must be "far su-

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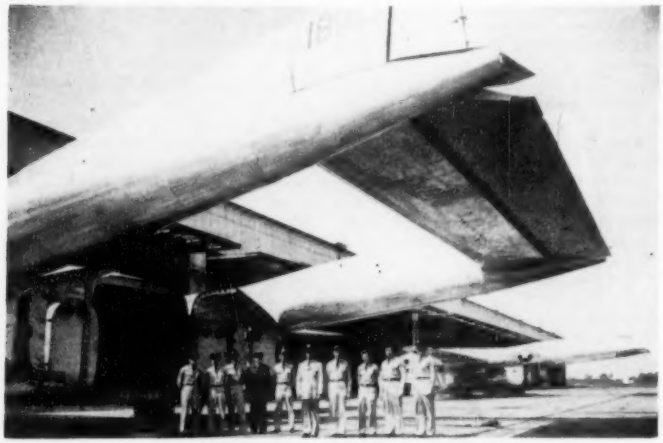

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Cabin aisle headroom	80 in.
Passenger capacity, first class	70-80

* Direct cost operated at 20-30,000 ft. (necessary on shorter hauls or against adverse wind gradients) should be comparable with costs of existing types of the DC-6 and Connie series.
** The 128-in. cabin width must be constant (no taper) to make possible five-abreast seating for aircoach use.

SOURCE: Air Transport Assn.

U. S. Sets Jet Liner Sights High

ATA specs call for a transport with twice today's speed at no more operating cost; stress is on safety.

By F. Lee Moore

The Air Transport Assn. last week revealed its first detailed jet transport design recommendations for U. S. manufacturers. The airlines stress safety above all else, but they also ask almost double today's speed at no more than today's operating cost.

Economic specifications can be summarized as a ton-mile operating cost and range comparable to the DC-6 and Connie series of today. Despite having a cruising speed of 550 mph. or more, the plane must be able to operate safely on today's airports and airways.

▶ **Safety First**—Major safety items detailed in the ATA study include:

• **Fuel storage** must all be outside the fuselage—either in wings or pods or both. An interesting footnote urges that manufacturers find out for the airlines how much it would cost to enable the plane to refuel completely in 20, 15, 10 and 5 min. This may indicate that some airlines plan in-flight refueling to boost payload and range.

• **Landing gear housing** should be designed so that tire explosion could not damage lines, wires, critical structure or accessories. Gear collapse should not endanger fuel tanks and lines. The plane should be certified for landing in crosswinds up to 40 mph.

• **Pod powerplant.** "It is imperative that the engine installation . . . assure an advancement in the safety of the airplane with respect to fire over that provided in present transport airplanes. An engine fire should not jeopardize the airplane primary structure, adjacent engines, or airplane and engine controls."

This requirement indicates the airlines want individual engine pods suspended below the wing.

• **Control boost** may be acceptable, but the plane must be safe even if the boost fails.

• **Structure problem** most worrying the airlines is pressurization, since there is no previous experience in pressurizing so large an area as a commercial passenger cabin at altitudes of 40,000 ft. or more.

• **Deceleration devices** must all be self-contained. No external aids like arresting cords or drag parachute should be required. Anti-skid devices are desirable, but what the airlines wish for most would be a new device equivalent to reversible-thrust props.

• **Fail-safe maintenance.** The airlines ask that "systems and components be designed so that it is impossible for mechanical personnel to incorrectly attach and connect functional parts in cases where hazard can result from incorrect attachments."

▶ **Flyability**—Because almost no scheduled jet transport experience is available yet, "it would be optimistic to imagine that all operating problems have been anticipated. . . ." Therefore, the airlines urge the manufacturers to watch results of BOAC's jet Comet operation and any other jet transport research and test programs such as the "prototype testing" bills proposed by CAA.

Plane must be able to maneuver safely at low speeds despite failure of one engine in a two- or three-engine plane or failure of two engines in a four- or five-engine plane.

Non-flammable hydraulic fluid or else pneumatic (air) systems must be used.

• **Fire protection.** The airlines make 14 specific recommendations for improving fire protection over that available in present transports. These include pneumatic power, better fire warning, and various shutoffs and firewalls.

• **External lighting** must be "far su-

perior" to any now used. The proposed jet transports would approach each other at an average speed of over 1,000 mph.

• **Sealed electrical system.** The airlines want to eliminate all electrical booby traps. Use of connector plugs and receptacles "to facilitate airframe manufacture should be prohibited." They urge liberal use of hermetically sealed units and of circuit breakers and built-in temperature-sensing devices for motor circuit breakers.

► **Navigation**—The airlines specify that they want provision for airborne radar, pictorial navigation computer, and visual traffic signal indicator. All of these airborne aids are in development now.

► **Reserve Fuel**—The airlines ask manufacturers to compute payload and range on the basis of present conventional reserve fuel requirements. But they recognize this may impose a severe penalty on the high fuel consumption of the jet. They ask manufacturers to study operating characteristics of the proposed plane at all altitudes in an attempt to find dispatching characteristics "to further rationalize actual operating fuel reserve requirements." However, electronic traffic control to speed traffic processing appears the greatest hope here.

► **Pressurization**—First demand of the airlines is for self-contained air conditioning capable of keeping crew and passengers in comfort on the ground as well as in all conditions of flight. Elaborate pressurization requirements are outlined in great detail. Upshot of these is a specification that the passengers and crew shall be in perfect comfort all the time.

Explosive decompression should be fully guarded against.

► **Dive Brakes**—The plane should be able to descend from 40,000 to 20,000 ft. at an average rate of 7,000 ft. per min. as a routine. In the glide path the plane should be able to glide at a 5-to-1 angle with engines set at high enough rpm. to reach takeoff power within two seconds if needed.

► **Landing Gear**—The ATA specifications ask manufacturers to try to avoid use of more than two wheels on one axle. "Tandem wheels should be avoided if at all possible."

Hong Kong Plans

(McGraw-Hill World News)

Hong Kong—Plans are underway to modernize Kai Tak Airport to take care of BOAC's proposed turbojet and turboprop transport services through the Far East. A London firm of civil engineers has been hired to do surveys. They face a difficult task, since the field has mountains on one side and seashore on another.

Western Granted Route Extension

Civil Aeronautics Board has granted Western Air Lines a route extension from Salt Lake City to Rapid City to allow the company a direct Minneapolis-Los Angeles service—a privilege that was sold by the same airline five years ago. CAB's 4-to-1 decision caused a stir in the industry because the Board previously has favored interchange over route extension to bring one-plane through-service to new areas. However, Defense Department support of Western's route proposal apparently influenced the decision.

CAB in this decision rejected United Air Lines application for a Denver-Minneapolis extension, the United-Braniff Airways interchange proposal and the United-Western interchange urged by the CAB examiner in this case.

The Board also says a proposed Trans World Airlines-Braniff interchange is not good enough because it is 161 mi. longer than the new Western routing. However, TWA says this interchange application, still pending CAB decision, may render better through-service than the new Western route. CAB emphasized that Western should provide local stops on the new service, so TWA says its one-stop interchange would actually be faster. It would also offer four-engine planes in competition with Western's proposed Convair service.

CAB Chairman Donald Nyrop wrote a strong dissent. He prefers the examiner-recommended United-Western interchange and says traffic on the new route will be thinner than forecast. Other major objections by Nyrop: Proposed three-stop Convair service is inferior to one-stop DC-6B interchange proposal; "disturbs the historical participation of other carriers in this market . . . proposed regional service will deal Frontier Airlines a body blow. . . ."

The Board majority arguments:

• **Western-United** coopcrative interchange is "violently" opposed by the carriers because of their intense competition in the West Coast market.

• **Adequate through-service** from South Dakota, Wyoming and Utah to the Coast "can only be met by granting Western's application."

• **Defense Department** urged certification to connect the Strategic Air Command base at Rapid City with the AF supply depot near Salt Lake City, upon which it is dependent for logistic support. Says the CAB majority on this: "We have . . . given somewhat greater weight to the testimony of the Department of Defense than did the examiner."

• **Subsidy needs** are not an issue with Western, the Board contends, since the company's mail rate is a "compensatory" one now.

• **Business diversion** from other airlines will not offset the benefit gained in the improved service.

• **Western's route integration** needs improvement.

Ham Standard Checks Hollow Prop Cracks

Two recent incidents involving Hamilton Standard hollow steel propellers have caused the manufacturer to review inspection and maintenance procedures of the airlines to make sure that they are adequate and conform to Ham Standard's recommendations and service bulletins.

Both incidents occurred with the Model 24260 16½-ft. Hydromatic reversing props installed on Boeing Stratocruisers.

In the first, prop had to be feathered on a Pan American World Airways' ferry flight after a crack in one blade extended almost all the way across the blade and about 4½ in. on the other side.

In the second, a crack was found under the de-icer boot extending about 3 in. on either side of the blade's leading edge, on a Northwest Airlines' 377.

Ham Standard believes the cracks probably resulted from damage in service.

Mobilizer Seeking Campbell Successor

Defense Mobilizer Henry H. Fowler last week was weighing the problem of picking a successor to William L. Campbell, chief of Defense Production Administration's Office of Production and head of DPA's Aircraft Production Board, who resigns effective Nov. 1.

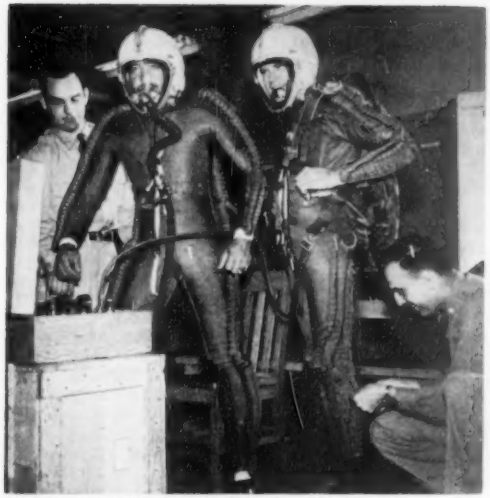
Campbell had planned to leave Oct. 1 but was persuaded to remain another month. Up for discussion is whether one man or two will be named to succeed Campbell in his double role. If the jobs are split, forecast is that the Aircraft Production Board post will go to an aircraft industry man.

LaMotte T. Cohu, former president of Convair, has been mentioned for the post, as he was previously when Campbell was named last summer to succeed H. L. (Bill) Boyer.

Catalina Airline

(McGraw-Hill World News)

Bogota—A new airline, named Selva, has been organized in Leticia, to establish scheduled service in southern Colombia. One Convair Catalina amphibian has been purchased from Avianca and acquisition of another Catalina is being considered.



BOEING'S "TEX" JOHNSON in T-1 suit is joined by other . . .

B-52 TEST PILOTS prior to making flight in new giant jet bomber.

ZIPPERING up the back . . .

ADJUSTING the headpiece . . .

DONNING the face plate.

AF Reveals High-Altitude Pressure Suit

B-52 test pilots in the above photographs show for the first time a new type emergency pressure suit recently announced by the Air Force.

In designing the T-1 high-altitude suit, the Air Development Center at Wright-Patterson AFB, Dayton, had the advantage of a three-year preliminary study made by a group at the University of Southern California. Beginning in 1943 this group investigated the physiological problems involved in perfecting a successful space suit, turning the whole matter over to the Air Force Aero-Medical Laboratory in 1946.

USAF realizes that the problem of survival at altitudes where the air is a near vacuum would have to be solved before the jet and rocket aircraft of the future could be developed, spent three years in intensive development work on its new pressure suit.

► **Combination Suit**—In the thin atmosphere above 50,000 ft. a flier's lungs must be supercharged in order to function, pure oxygen alone being insufficient. At 63,000 ft., in the absence of some sort of pressure suit, blood will "boil," resulting in body expansion to twice normal size and almost instant death.

Discarding earlier cumbersome patterns in pressure suits, the Air Force T-1 combines altitude protection with anti-G suit, crash helmet, earphones, microphones, oxygen mask, goggles, defroster and oxygen bailout bottle.

The T-1 is inflated automatically if cabin pressurization is lost. The problem of applying counter pressure to the surface of the body was solved by a new method and pilot's lungs are charged with high-pressure breathing oxygen from the inflated suit and helmet, thus preventing his collapse.

► **Other Problems**—During developmental work on the suit, one complicating factor was to make it adaptable to the varying sizes and shapes of the human figure. It was important that the suit be mass-producible.

N.Y. Copter Service Starts This Week

Metropolitan New York's first scheduled helicopter air mail and parcel post service (AM-III) is scheduled to begin at 3 p.m. Oct. 15 when a New York Airways' Sikorsky S-55 takes off from the carrier's base at LaGuardia Field to shuttle its Post Office Department cargo between LaGuardia, Newark and Idlewild International Airports.

The mail service initially will be confined between the three airports since there exists no suitable heliport on or close enough to metropolitan post offices—though studies are underway for such facilities.

The NYA S-55, first of three the CAB-certificated carrier is getting this year, will be fitted out to carry approximately 1,300 lb. payload. Later, when New York Airways is ready to fly passengers, they will have seven seats plus the crew of two. This latter phase will await the company's gathering experience and data on fares.

The copter shuttle is expected to shave considerable time from present surface transportation between the three fields—for example, S-55 time from LaGuardia to Newark will be about 16 min. compared with about four hours by truck.

Since the copters will be flying over water in the metropolitan area, they are being fitted with 75 lb. of flotation gear; an inflated bag in the tail cone and a deflated bag on either side of the cabin.

In addition to a full gyro panel, New York Airways' S-55s have Bendix TA-18BB crystal-control communication equipment with companion MN 84 receiver. There are 280 channels on the receiver and 360 on the transmitter. Included are provisions for later installation of omni and DME. NYA claims that theirs is the first such installation of the TA18BB on copters.

Canadair Favored To Build Britannia

Another big production job may be just around the corner for Canadair Ltd., busy segment of the Canadian aircraft industry. The Royal Canadian Air Force has been culling through aircraft prospects to replace its Merlin-powered North Star long-range transports and naval reconnaissance Lancasters.

Although no decision has been reached, the turboprop-powered Bristol Britannia is in a top-favored position for the choice, reports indicate. If it is picked, it will be used for transport or reconnaissance work, or may even be fitted for both types of operations.

New Twist

Trend toward greater simplicity in U. S. military aircraft designations was welcomed last week by the aviation industry which has long pondered the fine distinction between a Navy Douglas R5D and an Air Force Douglas C-54 and other such two-service planes built virtually to identical specifications.

The trend came to light in Navy's announcement that it was buying the North American T-28B. AVIATION WEEK inquiry disclosed that the Navy was retaining the Air Force T-28 designation, instead of calling it the TJ-2 as had been planned. The new twist in designations results from a Munitions Board policy directing that any two-service airplane shall have the designation given it by the first service to order it. The policy is not retroactive, however, so the simplification is still fraught with overtones of military complexity.

► **Room for More**—Canadair's production record and facilities point to its choice for this plane-building job, because the RCAF will want construction to be carried out at home. Right now, Canadair is loaded with projects and if it takes on a job such as the Britannia, some changes will have to be made to accommodate it. But the room is there at its Montreal facility and some expansion, line rearrangement and shuffling of work should take care of the space problem.

Meanwhile Canadair is busy pushing present work. The first Canadair-built Lockheed T-33 jet trainer will come off the line late this month or early in November. Monthly peak production rate—40—will be reached about four months later.

The first Beech T-36 trainer the company is building should roll off by midsummer and also probably will reach a peak rate of 40 per month.

► **Other Projects**—The North American F-86s Canadair is producing still are taking General Electric jets and there is no word yet as to just when Avro Canada's Orenda engine will be fitted into the production scheme. Meanwhile Canadair has been test flying one of these engines in an F-86.

On the transport side, Canadair's projected CL-21 feederliner is approaching the end of the survey stage. In December, when the prospect reports are in, the company's top officials will meet to decide whether to go ahead with prototypes for three versions—28-, 30- and 32-placers. A strong competitor for the plane has appeared in the Fokker F.27, a 28-place job, available with Dart turboprops or Wright Cyclones. Two prototypes of this plane are now being developed.

NAA Sells T-28B Trainer to Navy

North American Aviation has sold a more powerful version of its tricycle-gear T-28 trainer to the Navy in a quantity production order.

Designated the T-28B, the new version is powered by a Wright R1820 engine with 1,425-hp. rating, instead of the Wright 1300 rated at 800 hp. used in the Air Force T-28A. A three-blade Hamilton Standard aluminum propeller replaces the hollow-steel Aeroproducts two-blader used on the T-28A but prop diameter remains substantially the same, as do most overall dimensions.

Performance comparisons for the two versions reported by the Navy show a large improvement for the B version all along the line: top speed 343 mph., compared with 283; service ceiling 37,700 ft., compared with 25,700; rate of climb 3,460 ft./min., compared with 1,755; takeoff run to clear 50-ft. obstacle 1,140 ft. compared with 1,780.

Each of the tandem cockpits has complete flight controls and instruments. Guns, rockets and bombs may be carried externally beneath the wings and a gunsight is located in the front cockpit.

► **Trainer X Effort**—It is understood the Navy will continue to use the SNJ North American trainer for primary flight training and that the T-28B will be a secondary or advanced trainer.

The T-28B version was developed as a North American effort to meet the Air Force's jet trainer X requirements, with its current piston-engine production trainer. USAF has not indicated that it will buy the T-28B, but it is obvious North American will make a strong effort to sell the new version to Air Force as well as to Navy. Meanwhile the Trainer X competition verdict is still unannounced.

Assistant Navy Secretary for Air John F. Floberg has been flying an Air Force T-28A which was loaned to the Navy under bailment some months ago (AVIATION WEEK June 30, p. 11).

Airline Organized

(*McGraw-Hill World News*)

Bogota—A group of Colombian investors and two U. S. pilots have organized a small airline which will use four-place Republic Sea Bees between the Pacific ports of Buenaventura and Tumaco. The airline has been named Servicio Aereo Costanero Ltd. (Seraco).

New live axle nose wheels on TIMKEN® bearings specified for the Convair 340

ALL the new Convair 340's built by Consolidated Vultee Aircraft Corporation are equipped with a completely new Menasco nose landing gear design. It consists of a live axle on Timken® tapered roller bearings revolving in an oil bath.

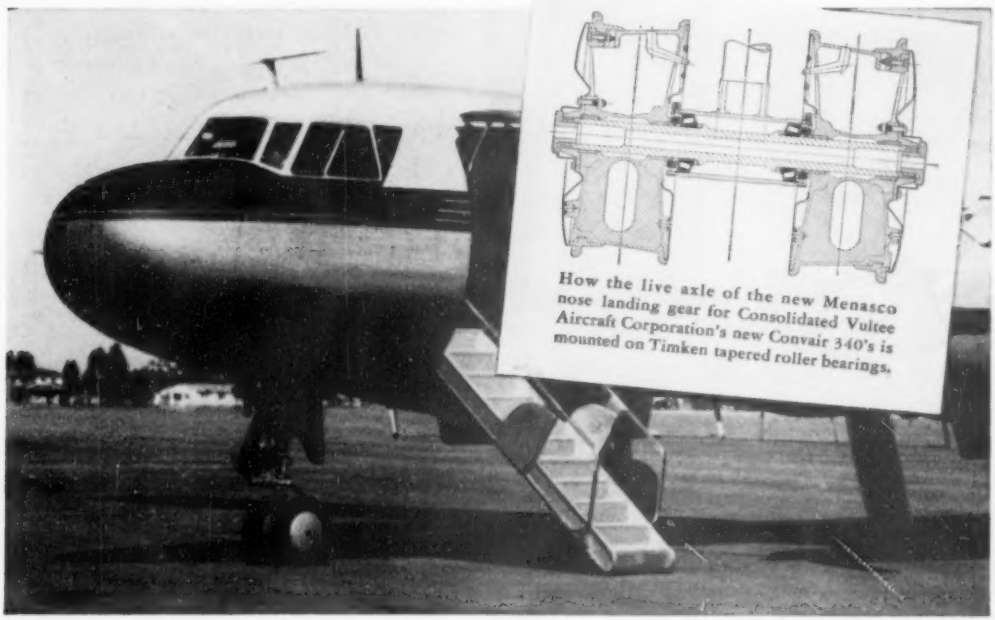
One of the reasons Timken bearings were specified for this application is that they provide long and dependable service with minimum maintenance wherever wheels and shafts turn. Timken bearings take the instantaneous shock load when the Convair 340 nose wheels hit the runway. Their rollers and races are case hardened to give them tough, shock-resistant cores and hard, wear-resistant surfaces.

Due to their tapered construction, Timken bearings carry thrust loads, as well as radial loads. They provide more capacity per pound of weight because of line contact between rollers and races.

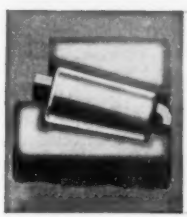
Timken bearings keep housings and shafts concentric, making closures more effective. Lubricant is kept in, dirt and moisture kept out. Maintenance and lubricant costs are reduced.

For smooth, dependable operation and long life in landing gear installations or wherever wheels and shafts turn, be sure to specify Timken bearings. No other bearing can give you all the advantages you get with Timken bearings. Look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How the live axle of the new Menasco nose landing gear for Consolidated Vultee Aircraft Corporation's new Convair 340's is mounted on Timken tapered roller bearings.



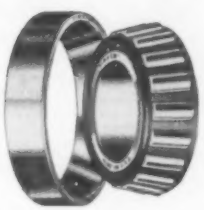
GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ∥ AND THRUST ▭ LOADS OR ANY COMBINATION

HOW G-E SILICONES OFFER YOU

IMPORTANT SAVINGS THROUGH NEW DESIGN POSSIBILITIES

Lighter, more compact design! G-E silicones (resin SR-98) in Class H insulation made possible a 25% saving in critical copper in the redesign (right) of this atomic-hydrogen welder. G-E silicone insulation permits the welder to operate at higher temperatures—provides exceptional resistance to moisture and chemical fumes. Use coupon for more data on SR-98!

Here's an opportunity to save time, money and materials! Take advantage of the new design possibilities offered by General Electric silicones. For example, new Class H insulation made with G-E silicones permits drastic reductions in the size and weight of aircraft autotransformers. G-E silicone rubber makes possible longer-lasting jet engine seals, diesel gaskets and aircraft ducting.

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New design possibilities of silicones are suggested in an informative booklet *The Silicone Story*. Why not write for a copy today? In it you may find the key to improving a product or process . . . possibly even a clue to making an entirely new product! Just mail the coupon.

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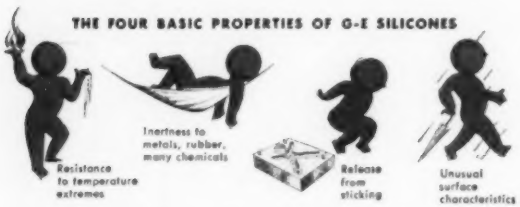
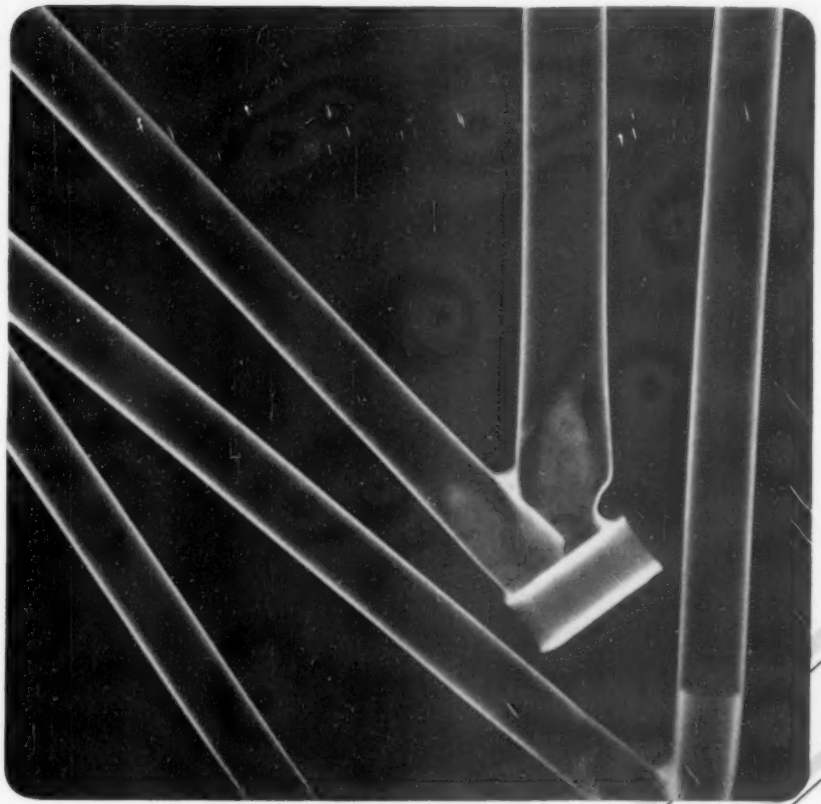
THE FOUR BASIC PROPERTIES OF G-E SILICONES


Resistance to temperature extremes
Inertness to metals, rubber, many chemicals
Release from sticking
Unusual surface characteristics

G-E SILICONES FIT INTO YOUR FUTURE

GENERAL ELECTRIC

Radiography checks—



then double checks

LANDING GEAR STRUTS lead a life of punishment. Though light, they must be strong. Their joints must be sound. Radiography is the method used to prove them sound.

A maker of amphibian aircraft goes even further. Though treated and sealed, strut members can develop internal corrosion and become weakened. Radiography alone can provide the required nondestructive examination of these internal surfaces. So it has become routine to x-ray these struts as part of the periodic inspection of the planes.

This is but one example of how radiography is proving a boon to the welding process. It is helping to open new fields for the use of welding—especially in the fabrication of highly stressed products and assemblies.

Look into the ways Radiography can aid your business. Your x-ray dealer will be glad to give you full information and assistance.

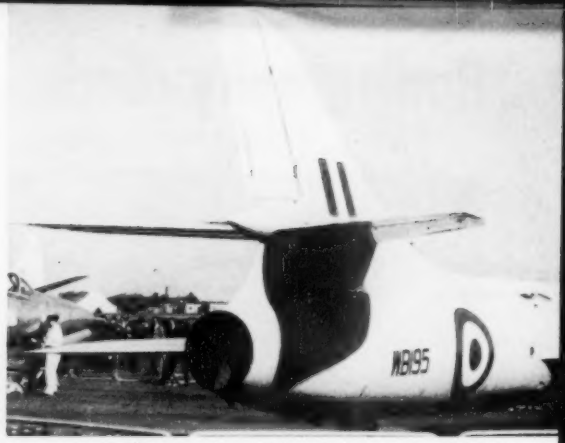
EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography—

another important function of photography

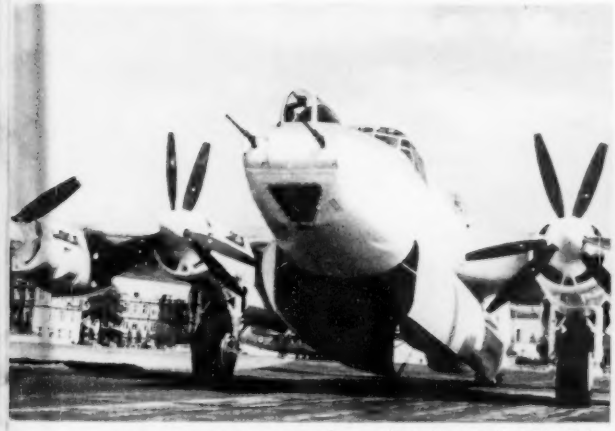
Kodak
TRADE-MARK

JAVELIN TAILPIPES now extend farther back than on first prototype. Spin-recovery chute housed in fin-top fairing will be discarded after development of normal recovery techniques.

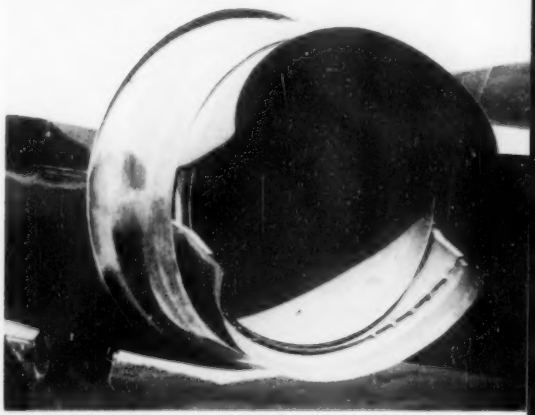


BULLET fills intersection of Hunter's horizontal and vertical tail, reducing flow separation and raising vertical Mach number. Informed sources say this single fix got Hunter over the drag hurdle into supersonic flight.

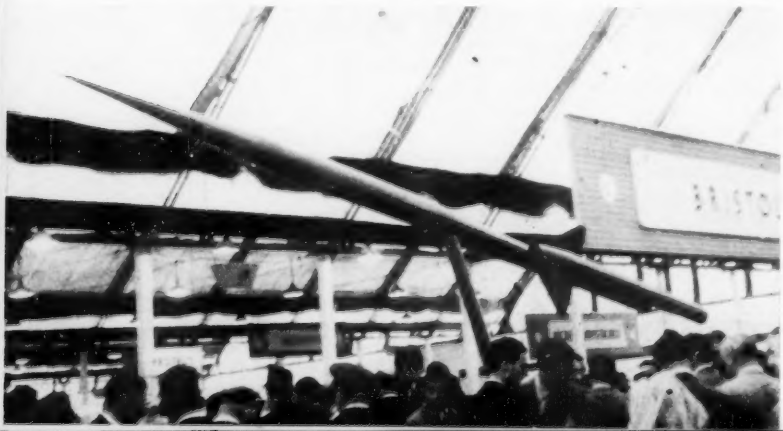
Camera Reveals British Design



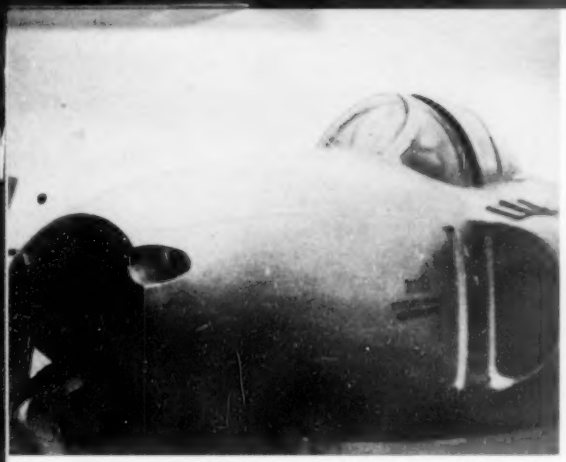
NOSE TURRET and gunner's position on Avro Shackleton Mk. 2 are mounted above bombardier's window. Guns are twin 20-mm. cannon. Other changes: three-section extensible radome and tail observation position.



OPEN NOZZLE of Rolls-Royce Avon with afterburner, as installed in modified English Electric Canberra, shows one solution to problem of variable-area opening. In closed position, nozzle looks stepped.



MISSILE by Bristol is elderly example of ramjet test vehicle. Main body contains fuel, controls and telemetering equipment. Ramjet engines are of 6-in. diameter, and simple pitot or normal-shock air intake marks them as capable of speeds in low supersonic range. Boost is from pair of 7.5-in. cordite solid-propellant rockets arranged in tandem. Flight velocity is slightly over Mach 1.0 at end of boost.



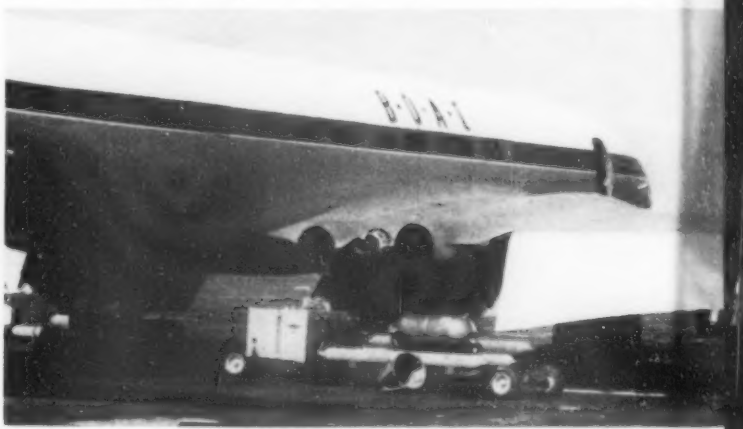
SWIFT'S BLACK EYE is gun camera. This particular aircraft has apparent provision for only two cannon in fuselage belly. Boundary layer air is removed by two bleed ducts, stepped and tandem.

BUTTERFLY TAIL of Supermarine 508 combines all-movable trim surfaces with servo-boosted movable control surfaces. Entire tail cone moves. Bullet fairing at end of fuselage is new this year.

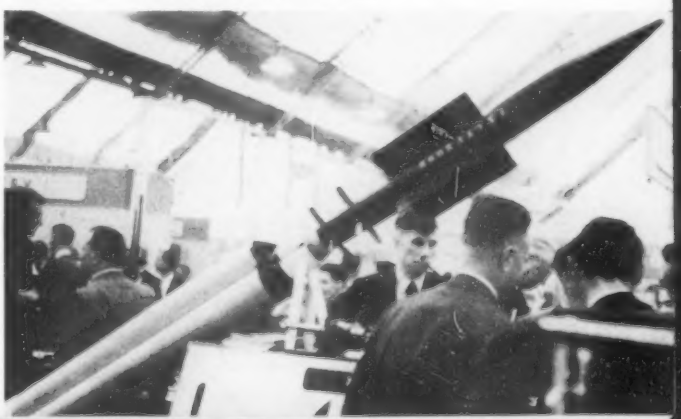
gr Details at SBAC Display

(*Story begins on page 32*)

SKEETER INSIDE is partly revealed. Engine is Cirrus Bombardier. Developed by Cierva, small copter was bought by Saro.



SPRITE ROCKET and servicing equipment as installed in the prototype de Havilland Comet jet transport. Not currently considered as necessary with Comets, the DH Sprite engine may lead the way to further developments with so-called "cold propellants" for added boost.



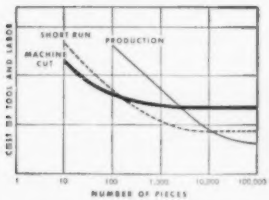
CONTROL TESTS are the prime purpose of this vehicle exhibited by the Ministry of Supply. Large surfaces are for lift, small tandem pairs for control. Three standard Rato units boost the missile to flight speed.

STAMPINGS

Our impartial use of three basic methods gives you economy regardless of length of run.

Most parts can be made by all three methods. But only **one** is **most** economical. The right decision is a technical one, based on **over-all** quantity, contour dimensions, tolerances and materials.

YOUR SUPPLIER SHOULD KNOW ALL THREE METHODS



This logarithmic chart shows the effect of these factors on the **specific part** illustrated. From 1 to 150 parts, our own **Machine-Cut Method** with no die cost whatsoever is most economical. At 150 parts, of the **Short-Run Method** using economical blanking dies and stock punches is best. At 10,000 units, the standard **Production Method** with standard dies is most satisfactory.

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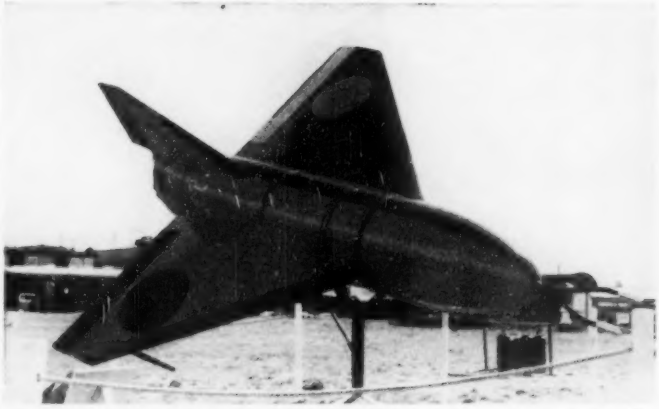
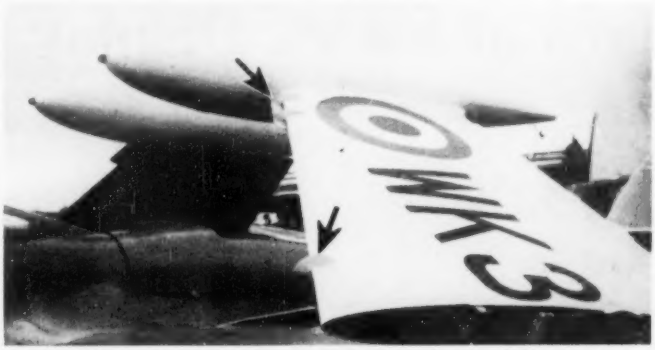


DELTA AIRCRAFT exhibited by Fairey's Research and Armament div., is rocket-propelled and autopilot-controlled. Presumably a test vehicle, model resembles Fairey F.D.1 delta plane.



WINGS FOLDED de Havilland Sea Venom shows small leading edge fixed slot at outer end of wing and wing fence inboard for aileron control at high angles of attack.

SBAC Design Details

(More pictures on pages 30, 31)

By David A. Anderton

Farnborough, England—The Society of British Aircraft Constructors' display is Mecca to aircraft designers. Nowhere else in the free world can every engineer from junior draftsman to chief designer examine so carefully all the contemporary planes in his industry.

Without clearance, without armed guards, without time limit, the technician can crawl over an aircraft, look inside the cockpit and poke his head into the wheelwell.

Sensational flight displays present the best performance of the planes. But it is in the static displays in the aircraft park and in the huge exhibit tent that the engineer spends most of his time. After you've seen one blistering flypast, you've seen them all; but you never tire of looking for detail, for design ideas and new gimmicks.

These are the features that can make or break an aircraft, that make it producible by women or watchmakers, that make it a fighting machine or a dog.

The designers' dreams on these pages may provide a set of reference axes for assessing the state of aeronautical engineering in Britain.

▶ **Fire Panels**—Many of the jet engine bays on the planes at Farnborough were equipped with fire panels, pairs of red spring-loaded doors placed at strategic locations in the skin of the compartment. Size is about 5 in. square, big enough to insert the nozzle of a fire extinguisher.

Panel doors swing in, and normally are flush-fitting; simple torsion springs keep them closed under flight loads. Judging by the varied use of these doors,

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1. SOURCE INSPECTION
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BOLTS
Bolt—Aircraft, AN3 to AN12
Bolt—Clevis, AN23 to AN32
Bolt—Aircraft, Drilled Head, AN73 to AN81, AN73A to AN81A
Bolt—Aircraft, Close Tolerance, AN173 to AN182
Bolt—Hex Head, AN101001 to AN101900
Bolt—Hex Head, Drilled Shank, AN101901 to AN102800
Bolt—Drilled Hex Head, AN102801 to AN103700
Bolt—Drilled Hex Head, 6 Holes, AN103701 to AN104600
NUTS
Nut—Castellated, Airframe, AN310
Nut—Plain, Airframe, AN315
Nut—Check, AN316
Nut—Plain Hex (Fine Thd.), 325
Nut—Castle (S.A.E.), 330
Nut—Plain Hex (Coarse Thread), AN335
Nut—Light Hexagon (Coarse Thread—Fine Thread), AN340—AN345
Nut—Engine—Slotted, AN355
Nut—Plain Engine, AN360
PINS
Pin—Cotter, AN380
Pin—Cotter (Corrosion Resisting Steel), AN381
Pin—Flat Head, AN392 to AN398
SCREWS—Slotted
Screw—Fillister Head (Coarse Thread—Fine Thread), AN500—AN501
Screw—Fillister Head (Drilled Head) (Coarse Thd.—Fine Thd.), AN500A—AN501A
Screw—Drilled Fillister Head Machine (Fine Thd.—Coarse Thd.), AN502—AN503
Screw—Machine, Round Head (Coarse Thread—Fine Thread), AN515—AN520
Screw—Washer Head, AN525
Screw—Machine, Truss Head, AN526
Screw—Sheet Metal Round Head, AN530
SCREWS—Phillips Recessed
Screw—Machine, Flat Head, 82° (Coarse Thd.—Fine Thd.), AN505—AN510
Screw—Machine, Round Head (Coarse Thd.—Fine Thd.), AN515—AN520
Screw—Machine, Truss Head, AN526
Screw—Machine, Flat Head, 100°, AN507
Screw—100° Flat Head (Structural), AN509
Screw—Brazier Head, NAS220 to NAS224
Screw—Sheet Metal Round Head, AN530
Screw—Sheet Metal Flat Head, AN531
Screw—100° Flat Head, Alloy Steel, CT205 to CT208
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NO. 1564 FLOOR FITTING and ring or chair stud for seats or cargo. 5000-lb. load. Manually positively operated to locked and unlocked positions; visibly indicated. Stud opening automatically closed when not in use.

ARS WEDJIT* and AR94 Ring-Stud. Hundreds of thousands of this Adams-Rite development are in use. Many styles for every weight and holding requirement for seats, cargo and equipment.

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NO. 1577 TIE-DOWN FITTING 30-G loading. Has 360° grip on stud. Guides prevent stud from hanging up when released. This fitting can be used with No. 1532 or any AN 7516 stud or equivalent.

NO. 1519 FLOOR FITTING and No. 1514 Ring-Stud. These fittings are identical to AMC X50B017 and X50A8023, and are designed to withstand loads of 3000 lbs.

NO. 1532 FLOOR FITTING to MIL-P-5175 spec. Similar fittings for use with No. 1417 or 1577 to meet heavier loading requirements are also available.

*For sale outside California contact Monadnock Mills, San Leandro, Calif.

Engineering Data Available

ADAMS-RITE MANUFACTURING CO.

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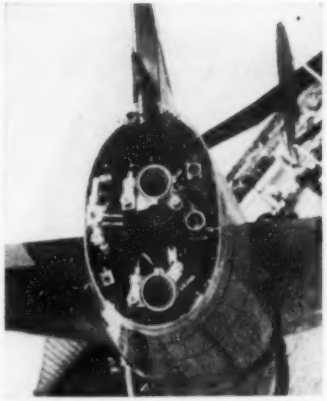
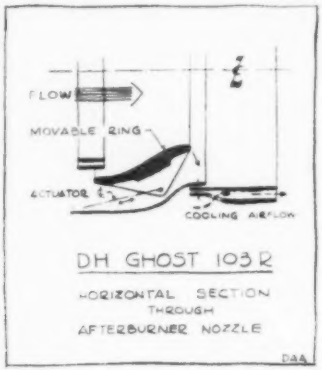


ROCKET MOTORS in tail of Fairey delta exhibit are representative of British ideas. Two motors are mounted so thrust lines pass through aircraft center of gravity.



they would appear to be SBAC standard parts.

▶ **Reheat Nozzle**—The de Havilland Ghost 103R has a different kind of afterburner nozzle. Most of the systems known to me have used the extreme aft end of the tailpipe as the variable-area discharge nozzle, and have featured sheet metal fabrication. DH uses a heavy ring, possibly forged, some distance upstream of the discharge nozzle, and split on the vertical center line.

Sketch above shows the general idea, although relative sizes are approximate. Actuation of the nozzle is hydraulic. The two actuators are mounted on the outside of the tailpipe on a horizontal plane through the thrust line.

Like most engines on display, the Ghost 103R had segmental discs blocking the view up the tailpipe; thus an observer could get no idea of the method of fuel distribution. This engine was demonstrated in flight in a

THE MINUTE MAN DIDN'T NEED A MANUAL!

When the Minute Man rushed to defend his home, no manual was needed to explain the simple workings of his flint-lock musket. In sharp contrast, today's highly complex military weapons require clear and concise operation and maintenance manuals to insure their most effective use.

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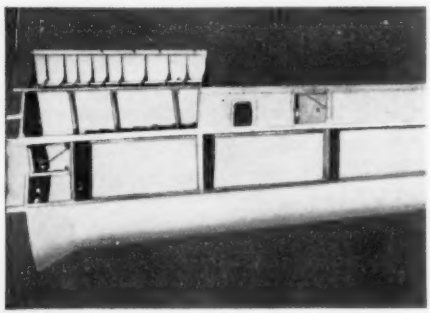
better wings *can be made with*

MAGNESIUM



Problems of critical weight, increased torsional rigidity, and simplified design can often be solved by using magnesium.

In the design of high-speed wings, for instance, the use of a thick skin . . . made possible with magnesium . . . offers many advantages. Illustrated at left is a complete fighter plane wing made with magnesium. Note the simplified construction. Although this wing, ready for flight, weighs no more than a conventional wing, *torsional rigidity has been increased 50%!* By using a thick magnesium skin, all spanwise stringers and half the ribs were eliminated, reducing the number of parts 69%, the number of fastenings 62%, and adding fuel capacity that increased the plane's range 18%!

Wherever the combination of strength and light weight are a design necessity, look at magnesium. Recent technical advances in alloying, fabricating and finishing have made magnesium a leading metal for aircraft construction.

THE DOW CHEMICAL COMPANY

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Fairey Gannet Fuel Comparison

	Wide Cut Gasoline	Kerosene	Gasoil
Reid vapor pressure, psi	2—3	0.15	<0.1
Flash point, deg. F	−10	>100	>150
Freezing point, deg. F	<−76	<−40	+10
Calorific value, Btu./gal	143,000	149,000	154,000
Calorific value, Btu./lb	18,700	18,600	18,300

DH Venom modified to take the installation. The acceleration caused by the additional thrust was apparent; but the additional noise was more so.

► **Rocket Motor**—Although all the guided missile work displayed at Farnborough has been around for a long time, designers could take a cue from the careful packaging of the Beta II powerplant. This unit has a thrust of 2,500 lb. for a duration of 40 sec. Fuel is a mixture of methyl alcohol, hydrazine hydrate and water; oxidizer is hydrogen peroxide.

Overall length of the power package is about 40 in., and the enclosure is a truncated painted arch with about a 16-in. diameter at the large end, fairing to about 12 in. at the small end.

The rear 40% or so is filled by the rocket motor itself and a pair of annular discharge ducts from the steam generator which drives the fuel and oxidizer pumps.

The motor is supported at the nozzle by a pair of machined fittings; the head is mounted to a bracket which is part of the internal structure of the nacelle. The steam generator, pumps, valves and fillers are all bracket-mounted in unit's forward part. In spite of compactness, all parts are accessible.

► **Turboprop Fuel**—The first naval aircraft to fly on the fuel used by its carrier is the Fairey Gannet. This plane is powered by the Armstrong Siddeley Double Mamba turboprop engine, and has been flying for some time now on a fuel called gasoil, used in the Royal Navy's aircraft carriers.

The table above gives the comparison of properties of gasoil, wide-cut gasoline and kerosene, all of which are used in the Mamba. Although the lower calorific value per pound of fuel reduces the engine power somewhat, the higher calorific content per unit volume more than offsets the power loss with increased range or endurance.

► **Aerodynamic Boost**—When the Bristol Britannia took off in the gusty crosswind which featured at least two days of the flight displays, observers were impressed with the rapid, large swings of the huge rudder. The reason: Bristol's aerodynamic boost system, developed from pioneering work done at the Royal Aircraft Establishment.

The idea is that the pilot's controls are connected to tabs instead of to the primary control surface. The stick force moves the tabs and the aerodynamic force generated moves the main surface. Because of the extremely low hinge moments with such a system, artificial feel has been included. Torsional springs in the control linkages are tied in with the airspeed system. The feedback to the stick furnished by the springs gives a feel of an ideal stick force per degree of surface deflection. Monitoring by the airspeed system serves to increase the feedback in proportion to the airspeed.

This unusual hookup also gives rise to a strange sight when the Britannia is on the ground. The main control

SABRE JET'S EDGE CUTS DEEPER

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Pastushin-made jettisonable fuel tanks give North American Aviation's F-86 greater fuel capacity . . . help give it that fighting edge in Korean combat.

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LOS ANGELES INTERNATIONAL AIRPORT, LOS ANGELES, CALIFORNIA

In the construction of their HTK-1 Navy three-place trainer helicopter, The Kaman Aircraft Corporation, of Windsor Locks, Connecticut, uses Du Pont Aircraft Explosive Rivets to solve an awkward fastening problem. Sketch shows how Explosive Rivets fasten upper door tracks to upper longerons of the cabin . . . a completely blind operation in tight quarters.

YOU CAN EASILY SOLVE AWKWARD FASTENING PROBLEMS

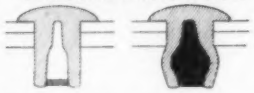
with Du Pont Aircraft Explosive Rivets

Whenever fastening must be done blind, or in almost inaccessible places, Du Pont Aircraft Explosive Rivets do the job quickly and easily. These modern fasteners help solve difficult construction problems . . . just as they speed and simplify fastening along open seams. They're set without a bucking bar—in as little as 1½ seconds—and require no after-finishing.

Du Pont Aircraft Explosive Rivets were developed by Du Pont during World War II, to meet the demand of the aircraft industry for simple, dependable and time-saving fasteners. Their use has steadily increased, until now ten times as many rivets are used per plane as formerly.

To find out how you can benefit from the versatility and long-run economy of Du Pont Aircraft Explosive Rivets, write for complete information and specifications. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

HOW DU PONT AIRCRAFT EXPLOSIVE RIVETS WORK:



1. Explosive Rivet is inserted in drilled hole. Cross-section shows cavity in shank containing minute explosive charge.

2. Tip of electrically heated Du Pont Riveting Iron is applied to rivet head, firing charge. Barrel-shaped head at shop end locks rivet securely in place.

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surfaces, being free to float or balance out at any position, do so, while both ailerons may be at full up deflection.

► **Tip Slot**—The de Havilland Sea Venom was parked in the static display with tiptanks mounted on folded wings. At the extreme outer end of the wing is a small leading edge fixed slot, hardly more than one-foot span. This detail and the wing fence on the inboard section of the outer panel probably serve the same ultimate purpose—that of maintaining aileron control at high angles of attack. This same slot is also on the Venom night-fighter.

LOCKHEED-DEVELOPED metal-plastic de-icer panel covers full length of F-94's wing leading edge. Heating elements are seen heading in from wing-fuselage junction. Tube extending over wing nose is for test spray.

New De-Icer Boot Effective on Jets

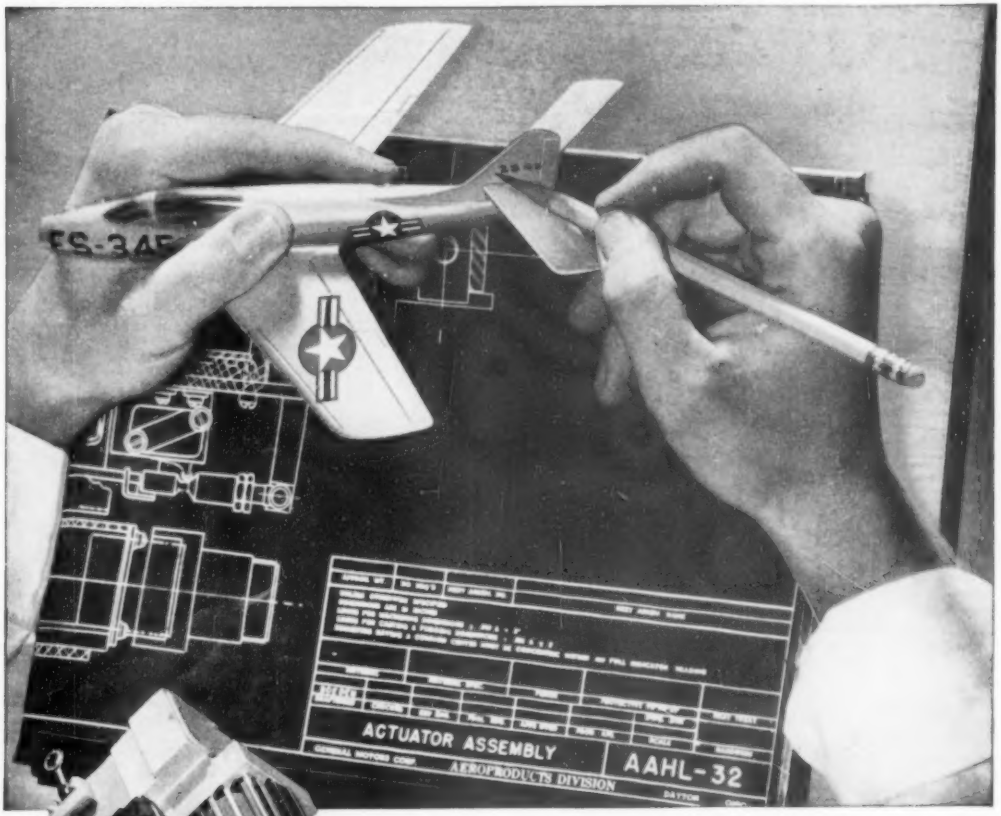
De-icer boot research is keeping pace with highspeed plane design.

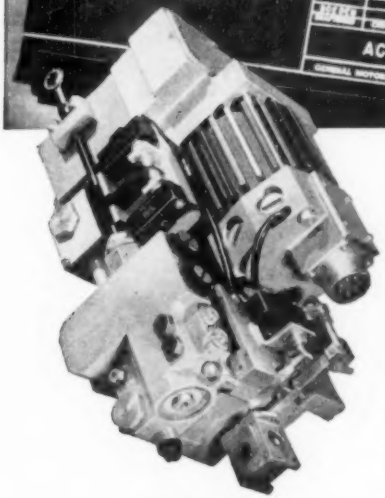
A new metal-and-plastic sheet, electrically heated for ice removal, is being used to keep clear the wing and tail leading edges of an F-94 Starfire, Lockheed Aircraft Corp.'s new interceptor. Initial flight tests on the plane have proved that the metal-plastic design can do the job, the company's chief research engineer, C. L. Johnson, reports. Claimed advantages:

- **Aerodynamically clean** construction, a key highspeed factor.
- **Quick response to heating current.**
- **Uniform surface temperature distribution.**
- **Cuts out water runback, refreezing.**

The result of a two-year research program at Lockheed, the boot is a silver-copper-plastic sandwich bonded to an aluminum-alloy base. It operates on 40 watts (a.c.) per sq. in., applied for 2-sec. periods at 1½-min. intervals under icing conditions. As much as 75 watts can be applied, if required. As the de-icer's heat breaks the ice bond on the wing or tail surface, the ice and water are blown away by the air stream.

Though the boot primarily was designed for military planes, report is that it will be adaptable for transports.





Self-Locking Hydraulic Actuator

"Designed to fit the job," describes Aeroproducts' new hydraulic self-locking actuators. They lock in *any* position without pre-selection or positioning—they stay in that position until changed. Aeroproducts actuators may be coupled for absolute simultaneous action. They feature manual, electrical, or pneumatic operation in case of hydraulic system failure. Designs have been approved and are being used for *variable control surface applications* and are being readied for jet engine variable nozzles, guided missiles, and others including commercial use.

Definite applications of this unit now being readied for production are for:
Republic F84F Flyable Tail • McDonnell F3H-1 Horizontal Stabilizer
Others unannounced.

APPLICATIONS

- Stabilizer Control
- Jet Engine Variable Nozzle Control
- Dive Brakes
- Variable Wing Incidence
- Flap Actuation
- Aileron Control
- Variable Wing Sweep
- Bomb Bay Door
- Cargo Door
- Landing Gear
- Turret Control
- Canopy and Seat Control

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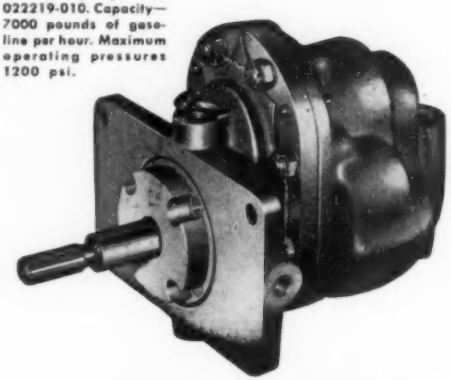
RCAF VAMPIRES are fed by dependable Pesco fuel pumps

The powerful DeHaviland Goblin jet engine that powers this sleek sky raider demands plenty of fuel at all times. Pesco fuel pumps have been selected as the replacement pump for all Vampires now in operation by the Royal Canadian Air Force.

This Pesco pump costs less originally, yet gives greater reliability, longer service life, and reduced maintenance costs. That's why more and more plane manufacturers and operators are using Pesco products for controlled flow of fuel. Pesco's skilled craftsmen have provided the precision-made fuel and hydraulic pumps and controls that are standard equipment on all types and makes of planes. It is experience and know-how that can help you.

Pesco fuel pump model 022219-010. Capacity—7000 pounds of gasoline per hour. Maximum operating pressures 1200 psi.



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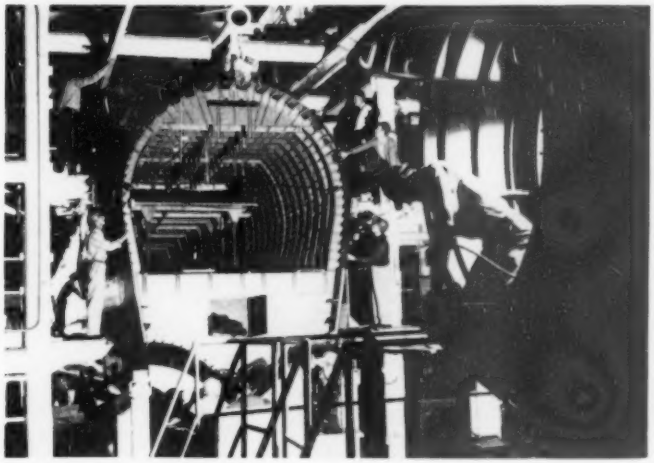
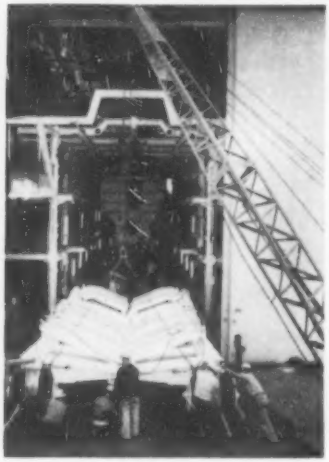
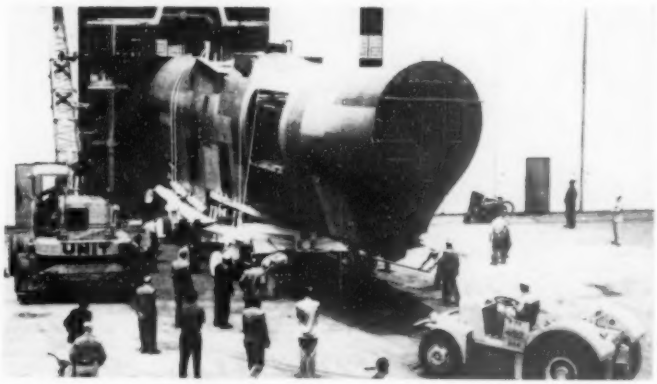
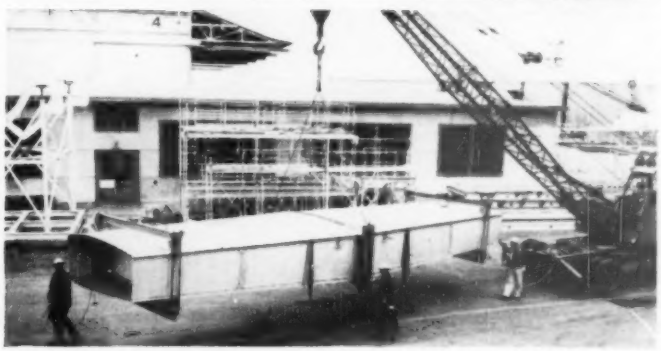




HULL CENTER section is moved from four-story assembly buck to cradle (foreground, right picture) by monorail cranes.

How Convair Puts Navy R3Y-1 Together





Navy's R3Y-1—cargo-transport version of the experimental XP5Y-1 turboprop patrol flying boat—has reached the final assembly stage at Consolidated Vultee Aircraft Corp.'s San Diego division.

First of the 80-ton R3Y-1s off the line will go to static test, while the flying article—the second production plane—is scheduled for takeup next March.

► **Turboprop T40s**—Power for the plane will be four Allison T40s teamed with contra-rotating Aeroproducts props, developing a total of about 22,000 hp. The pressurized craft has a length of about 130 ft., with length-to-beam ratio of 10. Span is about 146 ft.

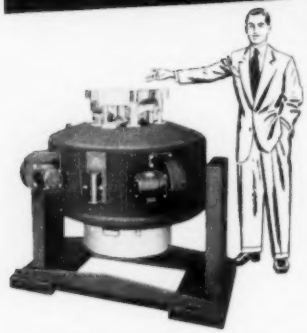
Design top speed exceeds 350 mph., takeoff time in a calm is about 30 sec.

The R3Y-1's ancestor—the XP5Y-1—was the world's first turboprop flying boat, and was the first full-scale plane developed from Convair's dynamic model research program. The XP5Y-1's proving unit was a 1/10-scale model, radio-controlled. It weighed about 125 lb., was powered by four midget piston engines developing 1¼ hp.

More than 2,000 test runs were made with this dynamically similar model—a practical research tool that sliced de-

HEADING FOR RENDEZVOUS are hull (upper photo) and wing stub (lower) of No. 1 R3Y-1. They will be joined for static testing of the structure. No. 2 airplane will fly first.

Vibration Engineering that solves your problems



PROBLEM: To perform vibration tests to MIL-E-5272 specification.

SOLUTION: The MB Model C-25 Vibration Exciter *rated at 2500 pounds force.*

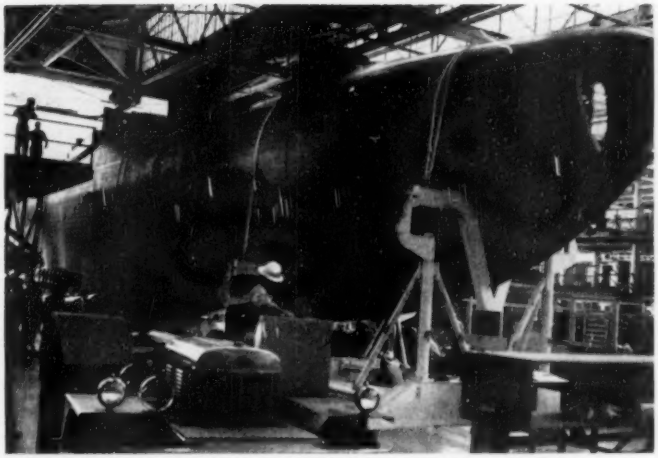
Shake testing gives a quick method of developing a product to withstand vibration. Such testing is vital in aviation. To meet the need, MB has applied its specialized vibration engineering to develop a range of shakers in various ratings for testing everything from electron tubes to airframes.

The big C-25 model develops large "brute forces" to meet vibration requirements of specification MIL-E-5272. It has heavy duty capacity for a wide range of work, including fatigue testing, shake testing of all types of electronic, electrical and mechanical components.

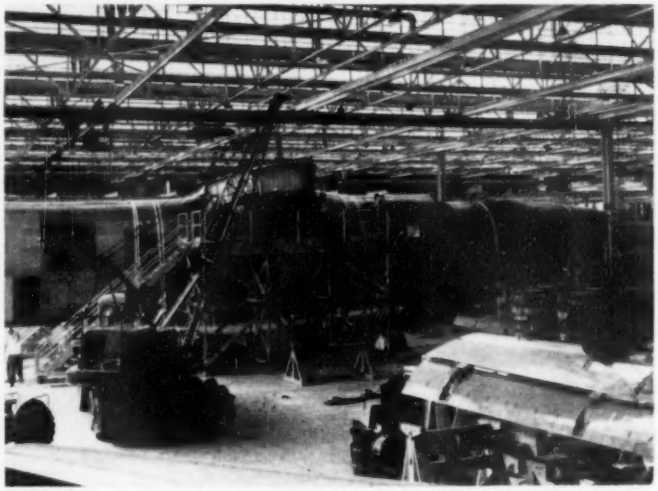
One of the largest and most dependable electromagnetic shakers available, the C-25 model is a good example of vibration engineering that has made MB "headquarters" for products to *isolate, control, reproduce, detect,* or *measure* vibration. More information on shakers in Bulletin No. 1-VE. Write us.

The widely used Pedestal MB Mounts, too, are produced by . . .

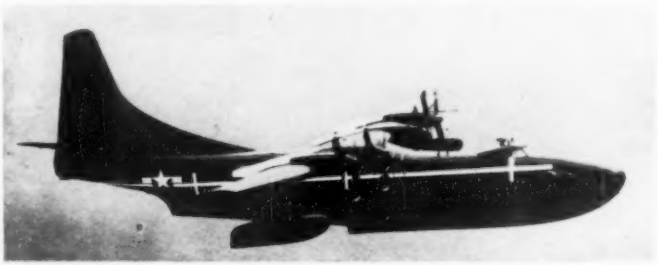
THE MB MANUFACTURING COMPANY, Inc.
1067 State Street, New Haven 11, Conn.



NOSE SECTION, on cradle, foreground, and center section will soon be joined.



R3Y-1 PROFILE, though incomplete, already shows plane's long, lean lines.

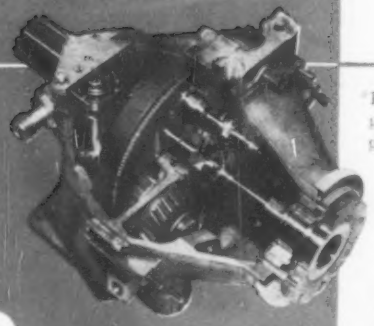


XP5Y-1, world's first turboprop flying boat, is ancestor of Convair R3Y-1.

velopment time and expense, additionally affording a factor of safety in proving out the merits of the prototype before actual construction.

The illustrations above and on p. 41 show how Convair mates the massive major components of the R3Y-1 in the San Diego facility.

200 HP
OR
10,000 HP
aircraft turbine REDUCTION GEARS



*Planetary reduction gear for 200-hp aircraft gas turbine

*Counter rotation reduction gear unit for 10,000-hp aircraft gas turbine

*Units not shown in comparative scale.

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USAF CONTRACTS

Following is a list of recent USAF contracts announced by Air Materiel Command:

Aeroil Products Co., Inc., Wesley St., South Hackensack, N. J., pressure cleaner, 154 ea., $450,979.

Aircraft Radio Corp., Boonton, N. J., radio transmitter, 35 ea.; radio receiver, 146 ea., $303,406.

Beech Aircraft Corp., Wichita, airplanes, 55 ea., spares for 1 lot, $3,798,865.

Bendix Radio division, Bendix Aviation Corp., Baltimore 4, Md., radar set, $579,838.

Chicago Aerial Survey Co., 332 South Michigan Ave., Chicago 4, bodies, 100 ea., lens cones, 108 ea.; magazines, 300 ea.; misc. components, 1,250 ea.; $2,075,300.

Dalco Radio, G. M. C., Kokomo, Ind., desk shelf, 2,284 ea.; distribution panel, 2,284 ea.; $1,229,134.

DeVilbiss Co., The, 300 Phillips Ave., Toledo 1, compressor, 616 ea.; spare parts, 1,223 sets; $259,069.

Eastman Kodak Co., 20 Avenue E, Rochester 4, hemisphere sights, 65 ea., $2,577,288; camera & tooling, 918 ea.; $1,341,981.

Fairchild Camera & Instr. Corp., 88-06 Van Wyck Blvd., Jamaica, L. I., N. Y., camera systems, 622 ea.; controls, 208 ea.; cable assembly, 249 ea.; $1,155,130.

Fletcher Aviation Corp., Pasadena, Calif., kits, $614,704.

General Electric Supply Corp., 601 E. Third St., Dayton, grip, 2,500 ea.; pole, 250 ea.; pruner, 500 ea.; pruner, 500 ea.; $29,518.

General Electric Co., Electronics division, Syracuse, N. Y., capacitor, 3 ea., $39,943.

Goodyear Tire & Rubber Co., The, 1144 East Market St., Akron 16, wheel and brake assembly, $140,075; wheel assembly, 558 ea. and brake assembly, 558 ea.; $1,347,557.

Graybar Electric Co., Inc., 232 W. Monument Ave., Dayton 2, bag, 500 ea.; clamp, 500 ea.; clamp, 250 ea.; grounding, 100 ea.; grounding, 100 ea.; $25,135.

Houston-Fearless Corp., The, 11801 West Olympic Blvd., Los Angeles, aircraft camera, 3,218 ea., $830,944.

Jack & Heintz, Inc., Cleveland 1, 1500 VA inverters, 435 ea., $201,718.

Kollsman Instrument Corp., 80-08 45th St., Elmhurst, N. Y., air speed indicator, 5,160 ea., $1,060,147.

Landers, Frary & Clark, New Britain, Conn., 2500 VA inverters, 2,000 ea., $580,290.

Line Material Co., 400 Ft. Michigan St., Milwaukee, Wis., transformer, 11 ea.; transformer, 118 ea.; transformer, 77 ea.; $61,801.

Munston Mfg. & Services, Inc., Islip, L. I., N. Y., audio coder, 73 ea.; audio decoder, 40 ea.; $117,901.

Reeves Instrument Corp., 215 East 91st St., New York 28, N. Y., video mapping groups, 13 equip.; video mapping groups, 54 equip.; $604,411.

Radio Corp. of America, RCA Victor division, Camden, N. J., components, 667 ea., $856,020.

Unistrut Products Co., 1013 Washington Blvd., Chicago 7, fabrication parts, 3 ea., $31,067.

Uptegraff Mfg. Co., R. E., Scottdale, Pa., transformers, 18 ea.; transformers, 12 ea.; $311,345.

Worthington Corp., 812 Race St., Cincinnati 2, compressor, 109 ea.; spare parts, 220 ea.; $323,185.

Wysong & Miles Co., 625 Fulton St., Greensboro, N. C., slip former, 169 ea., $85,400.

Aeroflex Laboratories, 34-06 Skillman Ave., Long Island City, N. Y., stabilized mounts, 100 ea., $1,621,487.

Airborne Accessories Corp., 1414 Chestnut Ave., Hillside, N. J., spare parts, $78,603.

Aluminum Co. of America, 1200 Ring Bldg., Washington, D. C., aluminum sheet, 186,000 lb., $71,141.

American Blue Print Co., Inc., 304 Madison Ave., New York, drafting equipment, $73,470.

Curved nose sections and side windows of Piasecki HUP helicopters are formed from large sheets of PLEXIGLAS II UVA. Fabrication by Steiner Plastics Mfg. Co., Glen Cove, Long Island.

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"Eyes of Flight", a new Rohm & Haas film used by the Air Force and Navy as an official training film on the maintenance of aircraft glazing, is now available for non-military showings. It is a 30 minute, 16 mm, motion picture in color and sound. Arrangements for use of the film can be made by writing to the Plastics Department, Rohm & Haas Company.

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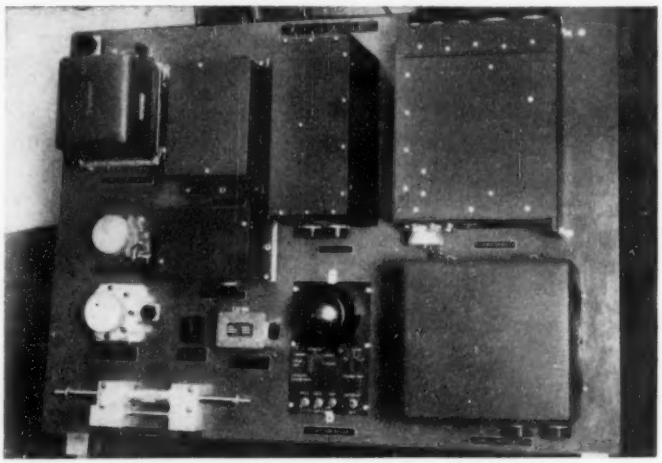


W-3A SYSTEM is broken down into many boxes, making installation in space-cramped F-94C easier. Only one of each component used is shown in display above.

Radar Orders Fly W-3A Autopilot

F-94C's Westinghouse autopilot reveals new role as target tracker; indicates possible design trend.

By Philip Klass

The Westinghouse W-3A automatic pilot used on the Lockheed F-94C marks the beginning of a new era for autopilots. It is the first production autopilot specifically designed to enable an interceptor to track down a target automatically by taking its commands directly from the plane's radar and computer.

Previously autopilots have been considered useful accessories which could relieve the human pilot of routine flying chores. Now they become a vital link in an interceptor's offensive armament system.

► **Design Highlights**—From a design standpoint, the W-3A is noteworthy because it:

• **Uses hydraulic actuators** instead of electric motor servos to position the airplane control surfaces.

• **Uses three rate-type gyros**, but no vertical gyro.

• **Allows pilot to use autopilot** for unlimited (360-deg.) airplane maneuvers about any axis.

• **Uses magnetic amplifiers** in place of vacuum tubes in its servo amplifier and in several other amplifiers.

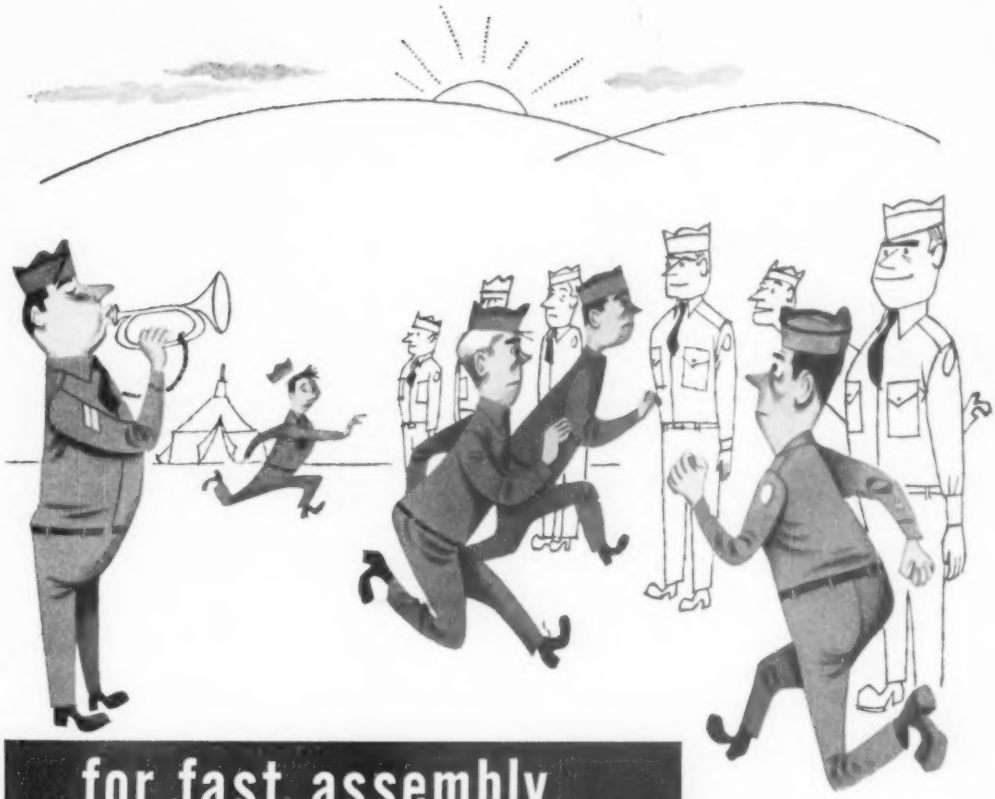
The W-3A can list several other "firsts." It is Westinghouse's first production entry in the highly competitive autopilot field which includes Minneapolis-Honeywell, Lear, Sperry, Eclipse-Pioneer, and General Electric.

The W-3A is also believed to be the first USAF fighter-type autopilot to be purchased by the airframe manufacturer (Lockheed) rather than being furnished by the government. In this respect it is a continuation of the trend started when Boeing obtained USAF approval to select the Sperry A-12D for its B-47 Stratojet.

► **Present Status**—Neither Westinghouse nor Lockheed will say much about the present status of the W-3A on the F-94C, but reliable sources say that there are still some autopilot airplane stability problems to be ironed out. The solution to such problems can only come from in-flight tests, and other airplane problems have reportedly outranked the autopilot in priority. USAF is said recently to have allocated an F-94C exclusively for autopilot tests.

For security, and possibly competitive reasons, Westinghouse isn't releasing too many details on its W-3A. It has lifted the veil sufficiently to reveal some interesting autopilot techniques.

The autopilot has an installed weight of about 100 lb., Westinghouse says. This makes it lighter than the Navy's



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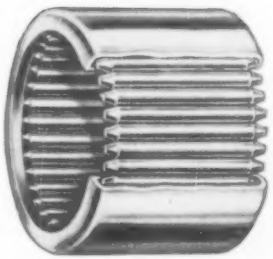

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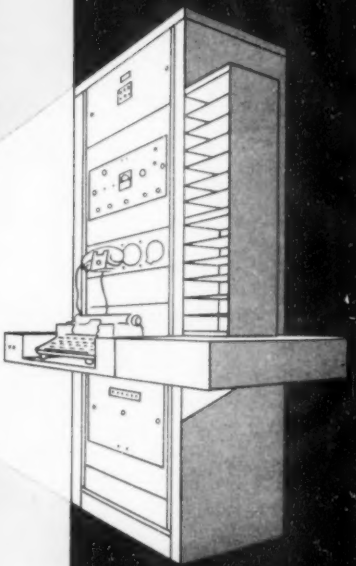

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G-3 (General Electric) and heavier than the USAF's Lear F-5. The autopilot is packaged in 15 separate components to permit it to be fitted into the space-cramped F-94C.

▶ **Four Modes of Operation**—The W-3A gives the F-94C pilot a choice of four different modes of operation. These are:

• **Cruise:** This provides conventional relief-type autopilot operation in which the system maintains the airplane on any desired compass heading and at constant barometric altitude. The human pilot can climb, dive, or turn the plane through the autopilot, with automatic coordination provided during turns.

• **Boost:** This unique arrangement is used when the pilot wants complete 360-deg. freedom of maneuvering about one or more airplane axes. Airplane pitching, yawing or rolling (not turning) rate is proportional to displacement of the flight controller about the corresponding axis. The human pilot must provide turn coordination in this mode.

• **Radar:** The autopilot is connected to accept command signals from the F-94C's radar-computer and to maneuver the airplane into firing position against the target.

• **ILS:** The autopilot is coupled to the output of the ILS localizer and glide-path receivers to enable it to maneuver the airplane down the ILS beams for a landing.

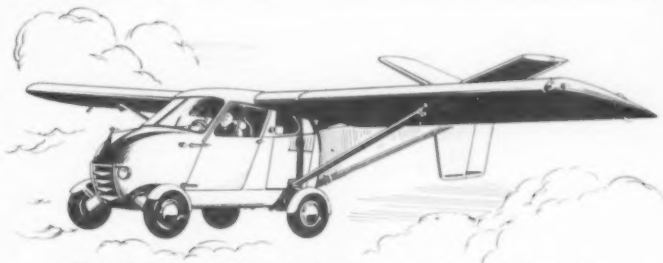
▶ **Flight Controller**—Command headquarters for the W-3A is the flight controller which mounts in the pilot's cockpit console. It contains a rotary selector switch which the pilot uses to choose the desired mode of operation—i.e., standby, boost, cruise, radar, or ILS (localizer, or localizer plus glide slope.)

The controller also contains the autopilot master on-off switch. Three toggle switches on the controller make it possible to disengage individual autopilot channels should the pilot want to fly one or more axes manually or in the

(Advertisement)

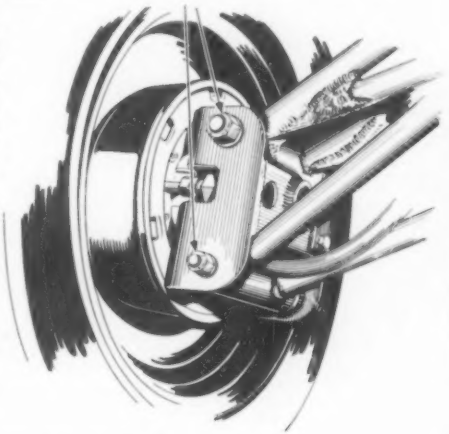
Fastener Problem of the Month

Fasteners for air and highway service **October 1952**



PROBLEM: The dual service planned for the Aerocar "Flying Automobile" posed a special fastening problem for its manufacturer, Aerocar, Inc., Longview, Washington. Severe stresses and vibration were certain to be encountered. Weight savings were important, as in any airborne unit. Speed of assembly was essential, in order to accomplish Aerocar's objective of providing this versatile means of travel at a price that would not seriously limit the market.

SOLUTION: Aerocar specified self-locking, vibration-proof Elastic Stop Nuts throughout the assembly. Elastic Stop Nuts are shown here on rear wheel landing gear bolts. Their holding power—proven through a quarter-century of aircraft performance—withstands the stress of air and highway service under the most severe operating conditions. Because no extra locking parts are required, weight is kept at a minimum. Assembly is simple and quick with no "extra" operations. According to Aerocar, the time and weight savings made possible by Elastic Stop nuts plus the safety factor they contribute, are essential in their concept of this type of transportation.



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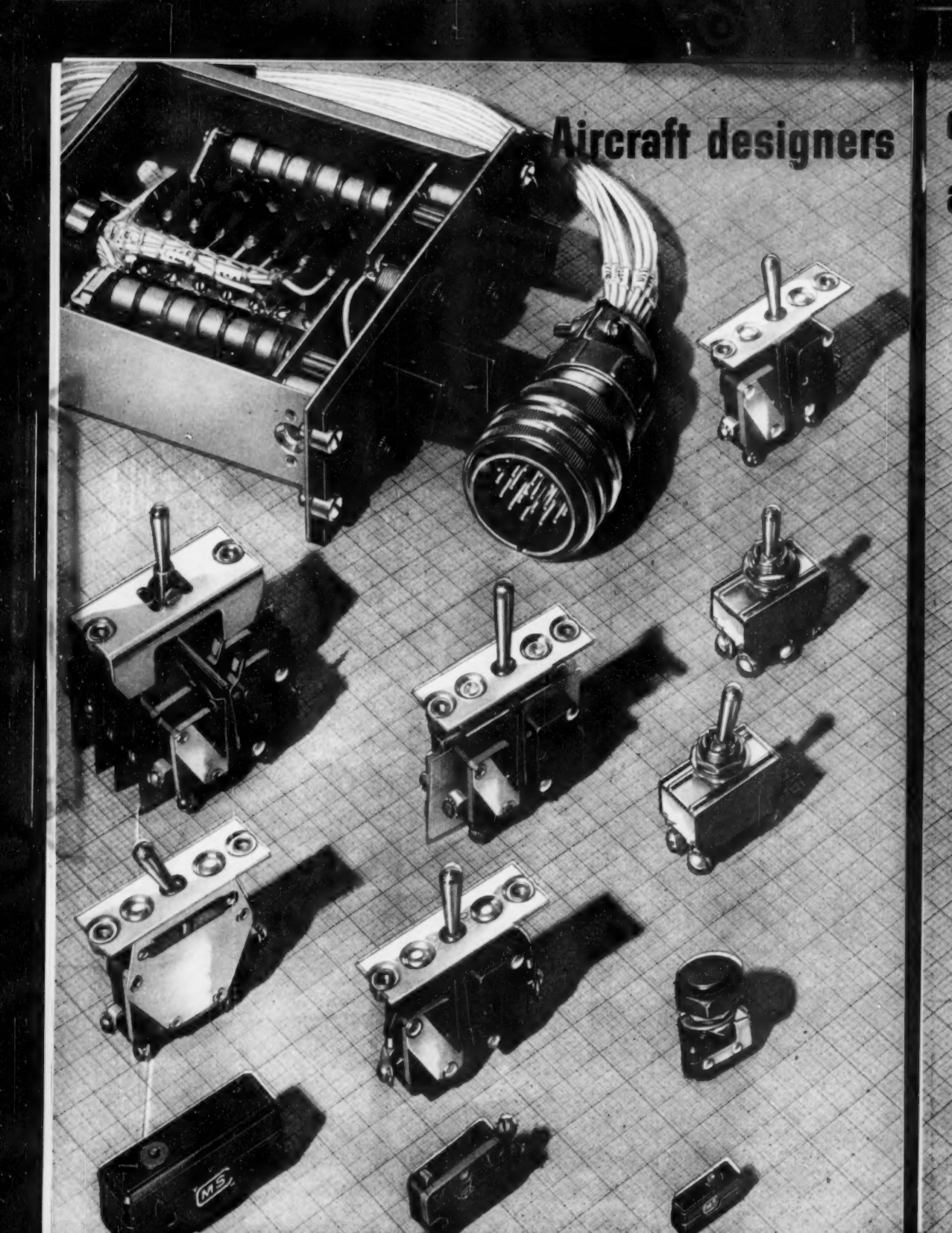
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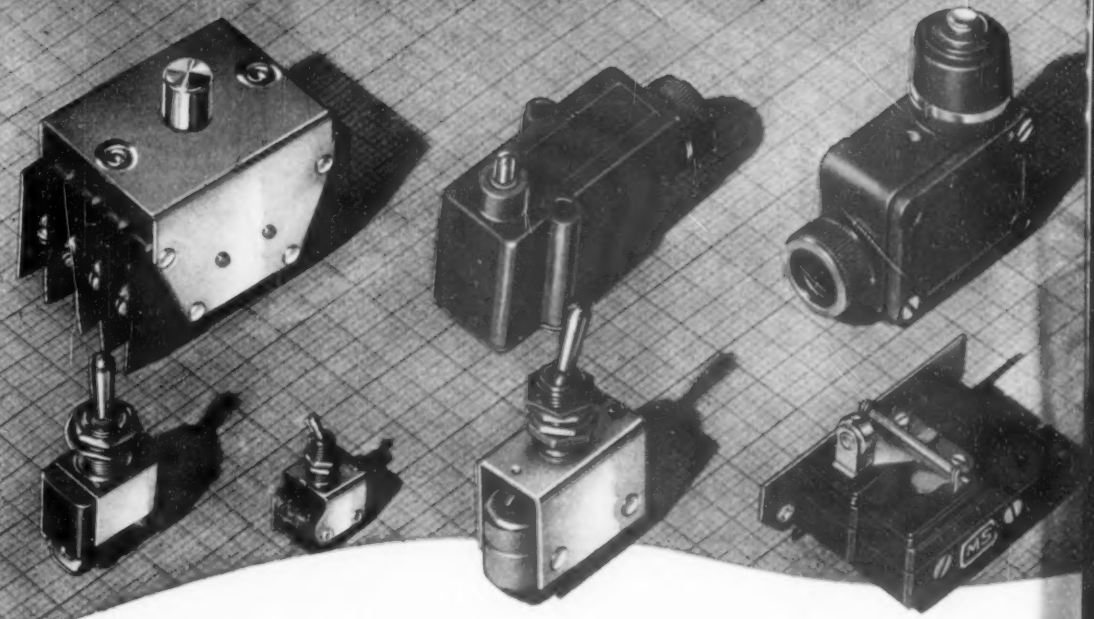

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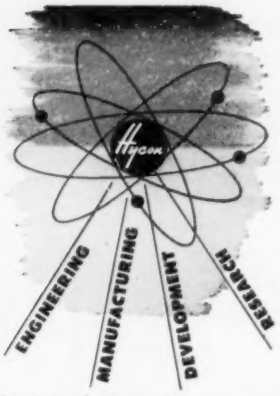

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event one autopilot channel should fail.

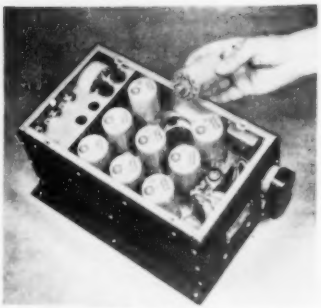
► **Maneuvers**—The human pilot introduces maneuvers by operating a novel sphere-shaped control which is capped with a rotatable knob. During cruise mode, the pilot maneuvers in pitch by displacing the sphere about its pitch axis. This gives a rate of climb or dive proportional to sphere displacement. Roll axis displacement of the sphere has no effect during cruise mode. Rotating the top knob gives coordinated turns whose rate of turn is proportional to knob displacement from neutral.

During boost mode, the flight controller permits independent three-axis maneuvering. Fore-aft displacement of the sphere gives proportional airplane pitching rates; roll-axis displacement of the sphere gives proportional rolling (not turning) rates. Displacement of the top knob in boost mode gives the airplane a proportional yawing rate.

The flight controller also contains a course trim knob for making small heading changes. Two small indicating lights on the controller show the pilot when the autopilot and the ILS approach coupler are in operation.

► **Return To Hydraulics**—W-3A marks the return to hydraulic servo actuators used in World War II autopilots. All postwar autopilots until the W-3A have used electric motor servo actuators.

There are two reasons for this change,



MAGNETIC AMPLIFIERS in plugin cartridges displace vacuum tubes in W-3A servo-amplifier.

and possibly a trend, to hydraulics

• **Hydraulic actuators are faster,** generally than electric motor servos and high response is needed to stabilize speedy jets.

• **Autopilot can** be integrated more effectively, as a rule, with the airplane's hydraulic boost system if the two systems share a common actuator.

The F-94C has a Lockheed-designed hydraulic boost system for ailerons and elevators; the rudder is manually controlled. Each of the two boost actuators is controlled from its own Lockheed-furnished boost valve whose stem is actuated by displacements of the pilot's control stick. This valve stem movement controls the flow of hydraulic fluid to the piston actuator which moves the control surface.

To tie the W-3A into the aileron and elevator boost systems, Westinghouse provides two identical electromagnetic control valves, one for each channel. The control valve converts the differential current output from the autopilot servo amplifier into a proportional hydraulic flow to operate a small piston which in turn displaces the Lockheed boost valve stem.

In this way, autopilot signals are converted into boost valve displacements which in turn operate the control surface actuators. When the F-94C is being flown manually (without autopilot), the small boost valve piston acts as a damper cylinder rather than an actuator.

► **Dual Follow-Up Signals**—The aileron and elevator channels provide two distinct follow-up signals for stabilization purposes:

• **Conventional displacement-type signal** generated by a potentiometer driven from the control surface.

• **Rate-type signal** generated by a small linear potentiometer driven by displacement of the Lockheed boost valve stem. Valve displacement provides a rate-type signal because the rate of hydraulic flow through the valve (and hence the rate of control surface actuator movement)

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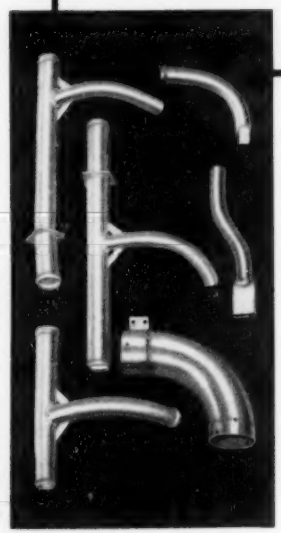

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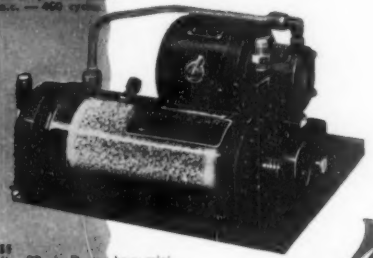
Capacity: 14 cu. ft. per hour under back pressure of 4.5 in. of water. Pump is rotary sliding-blade type — requires no lubrication. Direct motor drive 1/50 hp., 27 v.d.c. continuous duty — also available at 115 v.a.c. — 400 cycle.



RR-9355
Capacity: 28 cu. ft. per hour minimum free air under back pressure of 4.5 in. of water.
Pump is positive displacement, rotary vane type — Self-lubricating Graphitar blades.
Motor: 1/5 hp. 115 v.a.c., 400 cps. single phase — No brushes.

LEAR-ROMEC Desiccators have been selected for an important assist in the successful performance of Bombsights produced by the Mechanical Division of General Mills, Inc., for the mighty B-47.

In these high altitude bombers, extreme altitude changes cause moisture to condense on lenses of the periscope bombsight. The LEAR-ROMEC Desiccator solves this problem by circulating dry air between the lenses . . . air that has been forced through the desiccant jar, and repeatedly returned to the bombsight lens dome in a renewed dry state.

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They have proved *outstanding*—year after year after year!

No wonder, then, that 40 percent of *all* aircraft oils used by major airlines in the United States is supplied by Sinclair.

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300,000 SKYWATCHERS

AIR ATTACK!... This alarm could be sounded in the U. S.—tonight, tomorrow, *any* time! If it is, then time will be priceless—every moment vitally important.

Fortunately we do have a warning system—a combination of radar stations and volunteer civilian skywatchers, the Ground Observer Corps. And the Air Force has protective squadrons of Lockheed Starfire interceptors ready to answer any alarm—climb quickly to the attack—locate and knock out invading bombers in any weather, day or night.

But unfortunately our warning system is not complete. We need 300,000 more volunteer observers! WE MUST HAVE MORE GROUND OBSERVER CORPS MEMBERS TO ASSURE 24-HOUR WATCH OF ALL VULNERABLE U. S. AREAS.

Radar cannot do the whole job, because ground stations can't always spot planes flying under 5,000 feet. The only immediate answer is sheer man power—patriotic men and women who will donate just a few hours each week to the security of the U.S. and themselves.

Too few people realize the need or urgency. You can help—by joining the Ground Observer Corps and by spreading the word. To volunteer, simply call your nearest Civilian Defense Office. Or send a postcard to Ground Observer Corps, United States Air Force, Washington 25, D. C.

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Look to Lockheed for Leadership

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ENEMY AIRCRAFT COULD PENETRATE U. S. DEFENSES

Early this summer top U.S. Air Force officials met with Civil Defense directors from 46 states and four territories, and reviewed in confidential detail the current efforts to defend America from surprise enemy attack.

"Despite a $300,000,000 radar fence around the nation's perimeter, gaps exist through which enemy aircraft could penetrate our defenses undetected," the meeting was told.

That's why America needs a total of 500,000 civilian skywatchers as members of the Ground Observer Corps. Nearly 200,000 have already volunteered.

"The only practical means of filling the gaps in our defenses is through a 24-hour operation by civilian volunteers," the meeting was told.

Why isn't America's radar network sufficient?

Defense gaps exists because of radar's line of sight principle, and radar's failure to penetrate opaque masses. Every mountain, every hill casts a shadow behind which enemy aircraft could sneak undetected. Even in perfectly flat country the curvature of the earth shortens the effective range. Equally alarming, radar is susceptible to jamming.

These gaps cannot be filled by Air Force personnel due to the staggering expense. That's why civilians are needed in 27 perimeter states to man Ground Observer Corps stations 24 hours a day. Here is a critical, patriotic job that requires just a few hours a week from each volunteer.

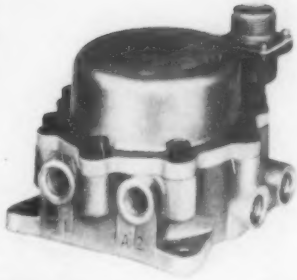
Aircraft too are an important part of our national warning system and of course are the backbone of defense against attack. Three advanced Lockheed planes play a vital role:

The WV-2 *Super Constellation* Early Warning Aircraft, developed for the Navy and the Air Force to extend radar's range in a whole new concept of national defense.

The P2V *Neptune* Navy Patrol Bomber, charged by the Navy with anti-submarine patrol and protection of U. S. coastal waters.

And the F-94C *Starfire*, the nearly automatic all-weather interceptor, which does the final job of climbing to the attack at terrific speed, locating the invaders, and shooting them down with more than human accuracy.

When the U. S. has all necessary planes and personnel—civilian and military—it will be difficult for enemy aircraft to penetrate U.S. defenses.



ELECTROMAGNETIC solenoid valve (one of three used) converts autopilot electrical signals to proportional hydraulic flow to operate servos.

is roughly proportional to valve stem displacement.

The rudder channel differs slightly from the aileron and elevator channels because it has no Lockheed boost system. For this channel, Westinghouse provides both the electromagnetic control valves and a small hydraulic actuator which is used to position the rudder.

Functionally the rudder channel control valve is similar to the other two control valves. However, the rudder valve uses a heavier-type of construction because it operates at higher pressures (approximately 1,200-1,500 psi.) than the other two valves.

▶ **Rate Gyros**—Westinghouse has used three rate gyros for stabilization, supplemented by a gyro-stabilized compass (Sperry J-2) and a barometric altitude control which takes the place of the usual vertical gyro.

Previous autopilots have used one or sometimes two rate gyros; the W-3A is believed to be the first to use them on all three axes.

Each rate gyro is a single-axis (one gimbal), spring-restrained device with an electromagnetic "E"-type pickoff. When the internal gyro element is displaced from neutral, the pickoff generates an a.c. signal whose phase and magnitude are a function of the direction and amplitude of gyro element displacement. This signal is rectified in a ring demodulator, contained in the gyro case, to convert it to d.c.

The gyro element can be displaced from neutral in either of two ways:

• **Rotating the gyro** about its "sensitive" axis. The direction and rate of displacement determine the direction and amount of gyro movement.

• **Applying a d.c. signal** to a small three-wire torque coil within the gyro case. The polarity and magnitude of this d.c. signal will determine the direction and amplitude of gyro element displacement. (An additional coil in the gyro

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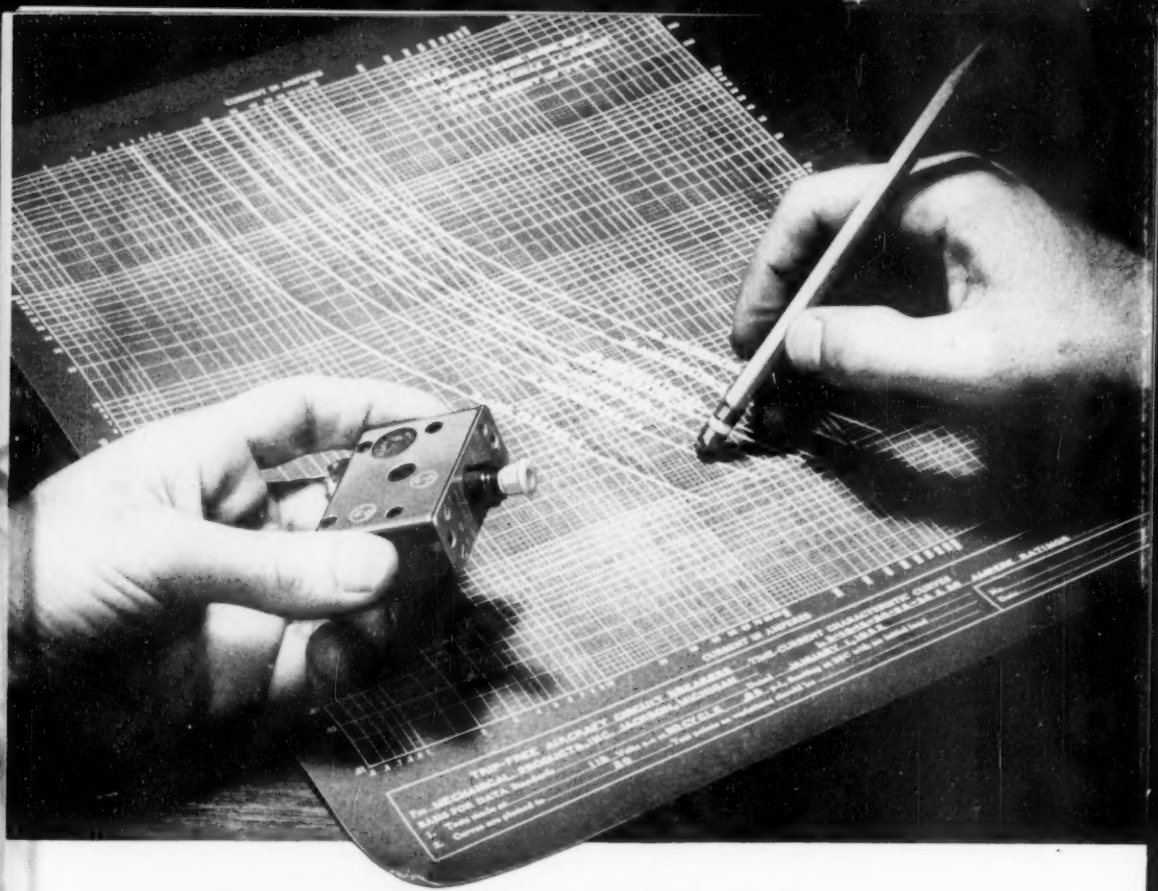

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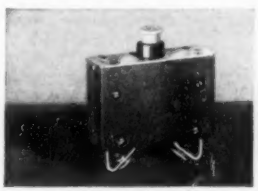

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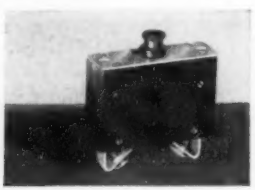

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is continuously excited to provide gyro damping.)

The three rate gyros are mounted in a single case, called an angular rate control. Each gyro has its sensitive axis aligned to detect motion about a different one of the airplane's three principal axes, i.e., pitch, roll, and yaw.

▶ **Rate Gyros in Boost Mode**—During the boost mode of operation, displacement of the flight controller sphere in roll or pitch applies a signal to the torque coil of the roll or pitch axis gyro. This displaces the gyro from neutral, generating a signal which is amplified in the correlator (servo amplifier) and applied to the electromagnetic control valve causing the corresponding control surface to be displaced.

As the airplane develops an angular rate about that axis, its rate gyro develops a precession torque which opposes the torque coil signal. When the airplane's rate reaches the value called for by flight controller displacement, the gyro element will return to neutral and the airplane will continue to pitch or roll at the same angular rate.

When the flight controller is returned to its center position, the system will halt airplane angular movement, leaving it in whatever attitude it was in when the controller was centered.

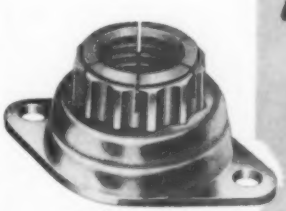
The yaw channel differs from pitch and roll in that its rate gyro torque coil is used solely for gyro damping purposes. When the flight controller knob is displaced in yaw, its command signal is fed directly to the servo amplifier to displace the rudder. The rudder moves until the yaw rate gyro is displaced sufficiently by airplane yawing to develop a signal which will cancel the original controller signal.

▶ **Rate Gyros in Cruise Mode**—During cruise mode, any angular movement of the airplane will cause the rate gyro aligned to that axis to precess and generate a signal calling for corrective control surface deflection. This will damp out unwanted angular motions. However, it won't keep the airplane on a selected compass heading or at a selected altitude.

To maintain altitude and heading, Westinghouse uses two additional signal sources: the barometric vertical rate control and the J-2 gyro stabilized compass. Each functions, in a sense, as an integrator to keep track of momentary altitude or heading changes. Each provides a signal to its respective channel to initiate control surface action to return the plane to its previous heading and/or altitude.

▶ **Vertical Rate Control**—The vertical rate control device provides two signals to the pitch channel to maintain the airplane at constant altitude. One is a displacement signal indicating the plane's total deviation from the selected altitude. The other signal is propor-

External Wrenching Nut Retainers



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. . . . has no equal where VIBRATION, TENSILE STRENGTH, CORROSION, HIGH TEMPERATURE are factors!

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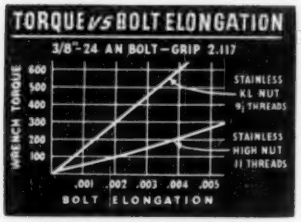

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tional to the rate of deviation from the selected altitude.

The vertical rate control uses a diaphragm type of aneroid element which has one chamber continuously vented to the static line; a second chamber is vented to the static line only when the human pilot is maneuvering in pitch (flight controller sphere out of centered position.) When the sphere is returned to center, the second aneroid chamber is sealed off, trapping air at the pressure altitude at which the vertical rate control will maintain the airplane.

When the pilot maneuvers in pitch while in cruise mode, the flight controller generates a signal which biases a torque motor in the vertical rate control. Under these conditions the vertical rate control calls for an elevator deflection until the airplane's rate of climb or dive creates a force on the rate diaphragm which cancels out the torque motor signal.

▶ **Turn Coordination** — Westinghouse uses a novel scheme for coordinating turns during the cruise mode. Rotating the flight controller knob displaces the rudder proportionately and simultaneously introduces a transient signal into the roll rate gyro. This in turn causes a momentary aileron deflection putting the airplane into a banked turn. The larger the knob deflection, the larger the transient signal to the roll gyro, and the larger the aileron deflection.

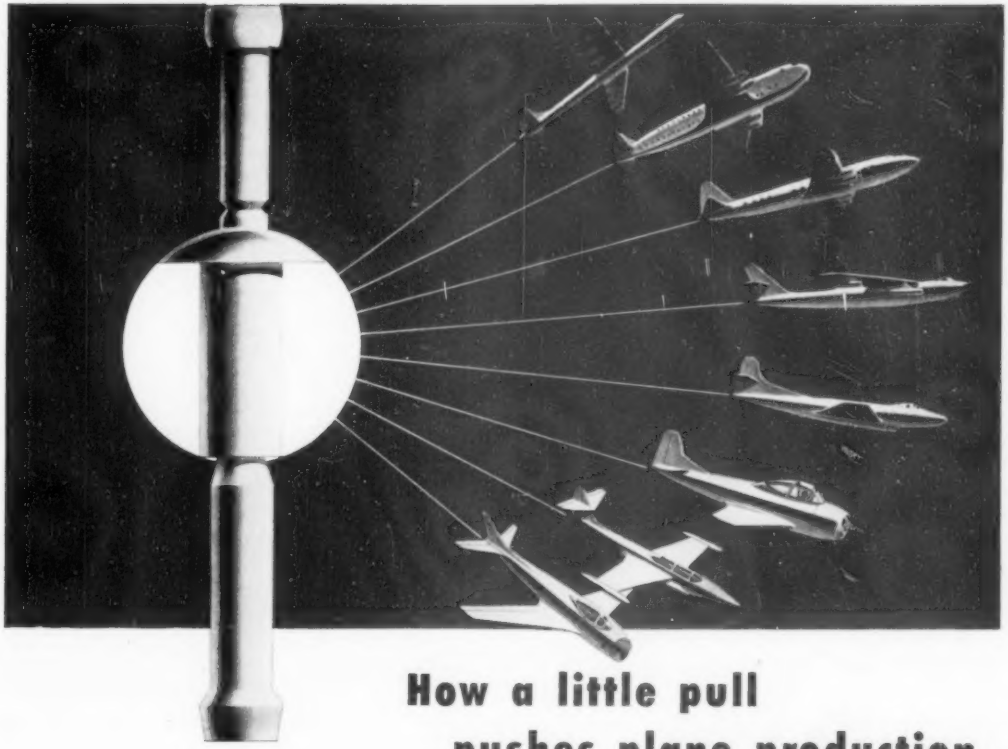
The coordination signal comes from a small pendulum within the roll gyro case. The pendulum is pivoted in such a way as to make it sensitive to lateral accelerations. During cruise mode (when coordination is provided) the pendulum is mechanically coupled to the roll gyro gimbal by means of a solenoid so as to apply precessing torques to the gyro. During other modes of operation, the pendulum is decoupled.

When the aileron deflection is not sufficient to produce a coordinated turn for the particular amount of rudder deflection, the pendulum will apply a precessing torque to the roll axis gyro, displacing it and generating a signal to call for more or less aileron deflection.

▶ **System Synchronization** — Westinghouse uses a novel method of synchronizing the autopilot to the airplane's attitude to prevent sharp transients when the autopilot is engaged. Prior to engagement, small synchronizing motors in the flight controller continuously position the turn knob and the sphere about its turn and pitch axes to null out any signals in the control system (the sphere remains spring-centered in roll).

With the autopilot in standby condition, the pitch and turn controls will follow any airplane maneuvers introduced by the human pilot using the F-94C's manual controls.

▶ **Other Features**—Other provisions in the W-3A include:



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It's a pulling action that sets Cherry Blind Rivets and makes it possible for them to be installed quickly and easily from one side of the work by one man. They require no bucking—no hammering—no exploding. This is why they are standard in the aircraft industry where they help improve aircraft production in several ways. The use of Cherry Rivets reduces man hours—lowers unit costs—makes possible refinements in design, all of which are important in producing more and better military and civilian aircraft.

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Cherry Blind Rivets represent one group in the 10,000 types of fasteners manufactured by Townsend to fabricate wood, glass, plastics, fabrics, and metal products. From this wide selection, Townsend engineers are able to provide you with almost any standard cold-headed fastener or part to help speed assembly—improve your products. They will also help design special fasteners for your particular need. For information on how you can benefit from their broad experience in solving your production problems, write today.

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• **Elevator trim tab servo** which operates to remove steady-state loads from the main elevator servo actuator, except during standby and radar mode conditions.

• **Pitch trim indicator** to show pilot whether airplane is properly trimmed about the pitch axis prior to disengaging the system.

• **Junction box** which provides a connection center for the autopilot and contains relays used to change from one operation mode to another.

• **Compass coupler** which serves to amplify signals from the J-2 compass and "isolate" it electrically from W-3A.

▶ **Approach Coupler**—The W-3A ILS approach coupler resembles, from an operational viewpoint, those used in other autopilots such as the Sperry A-12 and the Lear F-5. The localizer beam may be intersected at angles up to 90 deg., Westinghouse says.

When the selector switch on the flight controller is positioned to "Localizer and Glide Slope," a rate of descent signal corresponding to a 2½-deg. pitch-down attitude is automatically introduced. This signal serves to smooth out minor ripples in the glide slope beam.

▶ **Limited Damper Operation**—The yaw or pitch channels of the W-3A can be used individually to perform as a yaw or pitch damper. However, the yaw channel will oppose a human-pilot initiated turn, an undesirable condition.

▶ **Reliability and Maintenance**—Although new to the autopilot field, Westinghouse's W-3A gives evidence of considerable design attention to reliability and simplified maintenance. For example, Westinghouse has replaced vacuum tubes with self-saturating magnetic amplifiers wherever possible. Its correlator (servo amplifier) uses mag-amps entirely. Only the approach coupler and compass coupler use vacuum tubes.

Mag-amps in the correlator have all been packaged in plug-in type assemblies for easy replacement. Where vacuum tubes are used, Westinghouse has gone to unitized construction in which the tubes, resistors, capacitors, etc., are "potted" in plug-in type containers. Westinghouse also reports that it has included easily accessible voltage-check points in its junction box.

Ohmmeter and Megger

New Model C-3 resistance meter can be used both as an ohmmeter and as a low-voltage megger for checking leakage resistance. Device will measure resistances in the range of zero to 0.5 megohm as an ohmmeter; leakage resistance in the range of one to one million megohms as a megger. Meter is made by Southwestern Industrial Electronics Co., 2831 Post Oak Road, Houston 19, Tex.

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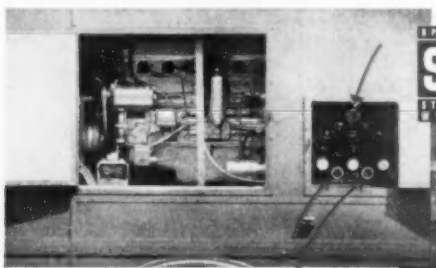
NEW mobile aircraft air conditioner by Airtemp brings complete all-weather comfort to airliners with South Wind heaters

Complete on-the-ground, all-weather comfort for airline passengers is achieved by this new mobile air conditioner by the Airtemp Construction Corporation.

Airtemp chose Stewart-Warner South Wind Heaters, acknowledged leaders in the field of aircraft heating, for dependable cold weather operation. The heater supplies up to 200,000 BTU's—more than ample, even for arctic operation—direct to the plane's own ventilation system. Stewart-Warner supplies the electric fuel pumps and instruments, as well.

Already chosen by Chicago and Southern Air Lines, United Air Lines and Capital Airlines, the unit is finding ready acceptance by the industry for its dependability and ease of operation. Another example of South Wind leadership.



Left hand panel of truck with engine door open for inspection or service. Drive is direct to compressor. The instrument panel on the right carries Stewart-Warner liquid level and temperature gauges.

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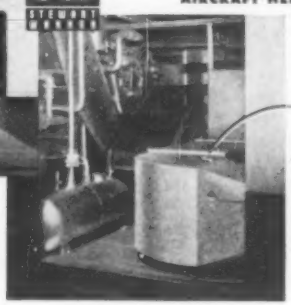

Heater installation. Only the damper control of the heater is visible. The South Wind heater itself is so compact that it fits completely inside the duct, yet supplies up to 200,000 BTU's of heat to cabin and cockpit.

FILTER CENTER

► **Security Casualty?**—An interesting-sounding paper entitled "Automatic Track-While-Scan Radar," originally scheduled to be delivered at the National Electronics Conference (Sept. 29 to Oct. 1) in Chicago was dropped for undisclosed reasons.

► **F-89 Augumenter De-sensitized**—Fear of structural damage to the F-89 tail reportedly has prompted USAF Scorpion squadrons to reduce the sensitivity (gain) of Northrop's new sideslip stability augmenter (AVIATION WEEK Sept. 8, p. 40). Result is that augmenter is less effective in damping out yawing oscillations.

► **Straw in the Wind**—An indication of the growing prominence of Hughes Aircraft in the avionics field: Its engineers gave more technical papers than any other company at the recent IRE Western Convention in Long Beach, Calif. Hughes engineers gave a total of 10 papers; Bell Labs was second with seven, Bendix Aviation third with four.

► **New GE Flowmeter For B-47**—General Electric has developed high accuracy, low-drag avionic fuel flowmeter which is slated for use in Boeing B-47s. Device reportedly measures mass flow rather than volumetric flow with less than 2% error. It can provide indication of instantaneous flow as well as totalized flow from the start of the flight.

► **Lear Reports**—Bill Lear reports he has racked up 115 hr. flight time on the newly announced automatic cut-off for the F-5 autopilot "without any inadvertent cut-offs."

► **New Technical Bulletins:**

• A new line of tiny power connectors in the range of 7 to 18 contacts for use in miniaturized avionics equipment, is described in DeJur Amsco Corp bulletin P 7-16. (Industrial Sales div., 4501 Northern Blvd., Long Island City, N. Y.)

• A new "D" series of miniature connectors ranging from 15 to 50 contacts is described in Cannon Electric Co. bulletin D-1. Connectors use steel shell and nylon insulation. (Adv. Dept., P.O. Box 75, Lincoln Heights Sta. 31, Calif.)

• Southwestern Industrial Electronics Co. has prepared a complete catalogue describing its low-frequency transformers and reactors, including a new miniature line. SIE says its transformers and chokes have unusually high inductance giving excellent low-frequency performance. (2831 Post Oak Road, Houston, Tex.) —PK

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Below: 10-engined B-36

Crystal Diode Tester

The dynamic as well as static characteristics of crystal diodes can be tested using a new device developed by Computer Research Corp. (A small time interval is required for a diode to recover its normal static resistance after each change in voltage polarity. When the period of this impressed frequency is shorter than diode recovery time, the diode will exhibit a higher resistance than under static or low-frequency conditions.)

The CRD diode tester can handle diodes with forward currents up to 100 ma. and back currents up to 1 ma. The device uses 115-v. 60-cycle power.

Computer Research Corp., 3348 W. El Segundo Blvd., Hawthorne, Calif.

New Small Relay

A tiny lightweight hermetically sealed relay designed to military Spec. AN-E-19 is available from Advance Electric & Relay Co. The relay may be obtained with coil resistances up to 16,000 ohms with either silver contacts rated at 1½ amp. or palladium contacts rated at 3 amp., in either SPDT or DPDT styles. Relay weighs 1.3 oz. Dimensions are 1x1⅛x1⅜ in.

Advance Electric and Relay Co., 2435 N. Naomi St., Burbank, Calif.

The direct-process prints and blueprints received from vendors are reproduced on Autopositive Paper when extra copies are needed for the drafting room or shop. Deletions and additions can be made readily on Autopositive intermediates . . . saving drafting time.

Drawing Reproduction Revolutionized

with Kodagraph Autopositive Paper

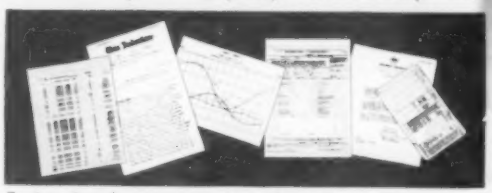
Here are some of the ways Sikorsky Aircraft, Div. of United Aircraft Corp., is using this photographic intermediate material.

There are no limitations now on the types of drawings, prints, or documents which can be reproduced in Sikorsky Aircraft's direct-process machine.

Translucent or opaque—it doesn't matter; even "two-sided" originals can be reproduced on *Kodagraph Autopositive Paper*. And each print is a sparkling intermediate—dense photographic black lines on durable, evenly translucent white paper—*ready* to produce as many direct-process prints as are needed.

How positive photographic intermediates are produced. Kodagraph Autopositive Paper is exposed in Sikorsky's direct-process machine . . . processed in standard photographic solutions. No negative step . . . no darkroom handling—*a revolutionary, economical operation that speeds print service to all departments!*

Six copies are needed of each oscillograph record obtained while flight-testing Sikorsky helicopters. Autopositive intermediates—which hold the faintest line—are made . . . and used to produce direct-process prints which are sharp and legible in every detail.



Engineering department reports, charts, letters—documents of every type—are reproduced on Autopositive Paper so that the required number of direct-process prints can be made. A local blueprinter handles the "overflow" demand for Autopositive copies.

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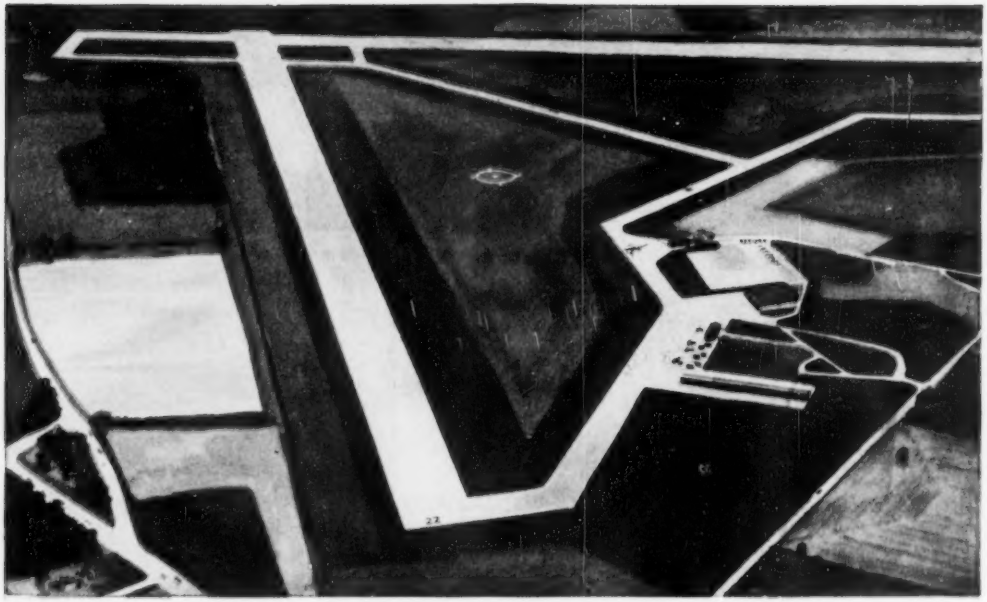

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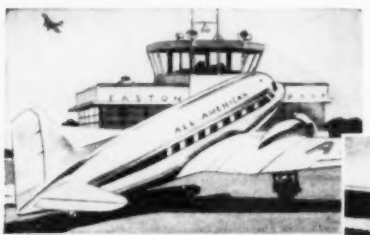
Easton's 500-acre Municipal Airport is the perfect answer for the busy flying executive who does business in Washington, D. C. Why not stop over next time you're near by?



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TWA Likes Super Connie Handling Ease

- **Visibility, vibration and control better in 1049.**
- **New model also has passenger refinements.**

By George L. Christian

Model 1049 Super Constellations recently put into service by Trans World Airlines incorporate several new ideas and refinements for the benefit of passengers and crew alike.

• **Aircraft gets off the ground** with considerable agility despite the 13,000-lb. increase in gross takeoff weight over the standard size Connie. In a flight with this reporter, plane took 30 sec. to become airborne from time full power was applied. Passenger load was near capacity, but fuel load was light.

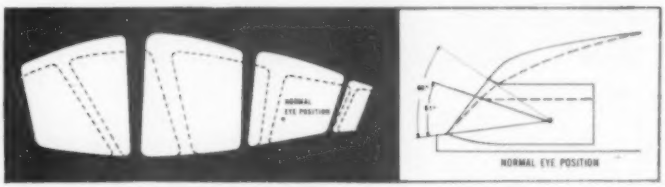
• **Vibration** within the cabin appears to be less than in its smaller predecessor.

• **Visibility** from cockpit and cabin has been improved and seats are more luxurious.

• **Lounge** gives passengers a place to move to, and berths are available for those who want to climb between sheets for the transcontinental haul to which TWA has assigned the planes.

▶ **Same Handling**—TWA Captain H. W. Sherwood states that there is no appreciable difference in handling characteristics of the 1049 compared to the standard Connie once airborne. You just bring them in over the fence a little faster.

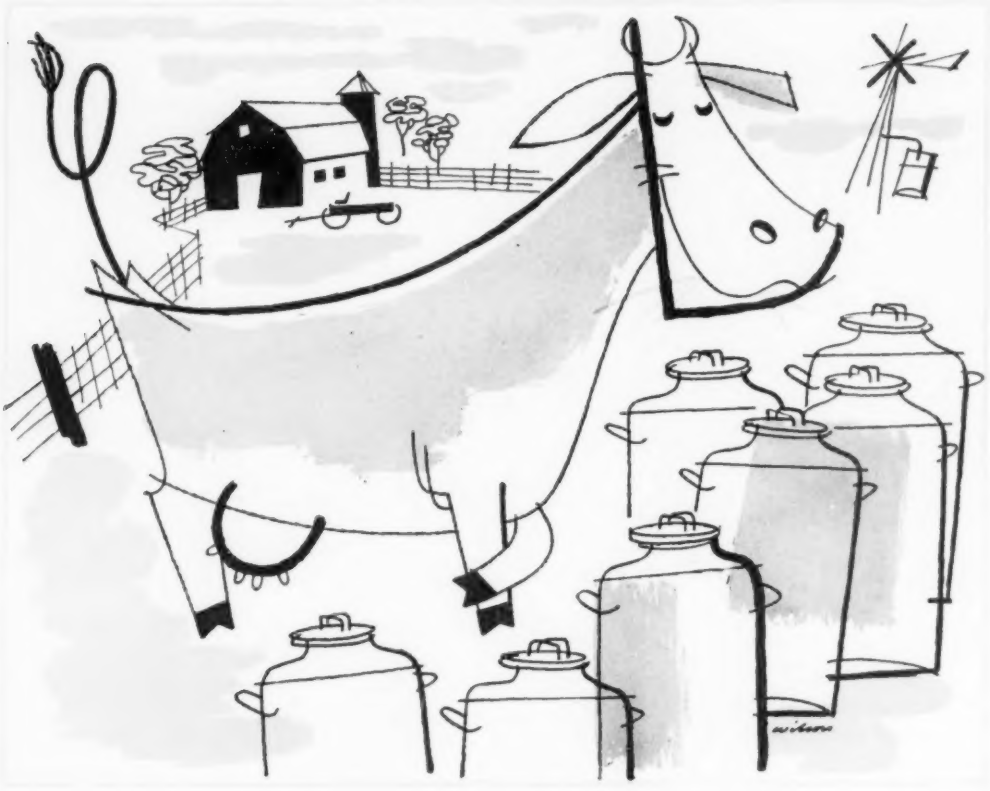
FOR GETTING OUT FAST, this chute and U-frame swing against plane door.



BETTER VISIBILITY of new cockpit window vs. old (dotted) is shown here.

Lockheed engineers point out that rudder control has been improved considerably by enlarging rudder-fin area approximately 25% over standard Connies. And lengthening the fuselage moves the empennage back, giving a 92-in. greater moment arm to the rudders. Longitudinal and lateral control remains about the same.

Purpose of the improved rudder con-



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. . . and when it comes to producing bellows assemblies, that's a job for Fulton Sylphon or Bridgeport Thermostat. For we are specialists in this field, and have been for half-a-century.

That specialized experience can be a big help to you—and make savings for you, too. See how.

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We produce bellows assemblies that are used throughout industry—as flexible connectors... for thermostatic devices . . . expansion joints . . . pressure controls . . . hydraulic mechanisms and for other uses. Whatever your requirements, find out how our specialists can help you get better results, at low cost. Write for helpful technical advice—ask for idea-packed Catalog TA.

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MAIN CABIN, looking forward, of TWA Super Connie. It contains eight berths.

LOUNGE seats seven and is located in tail. Two seats are out of camera range.

FORWARD COMPARTMENT has been lengthened and seats 16. It has its own entrance.

trol is not only to better the control characteristics of the piston-engine 1049 series, but to take care of the greatly increased torque of turboprop powerplants, when they are installed. Increased rudder control is particularly essential under engine-out conditions.

► **In the Cabin**—Cabin noise level appears about the same as standard Connies. The 1049 has better sound insulation than the standard Connie, but the jet stacks counterbalance that. Noise level of the compound-engine 1049s should be considerably lower be-

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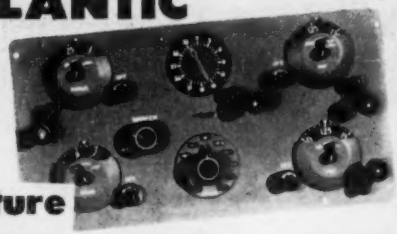

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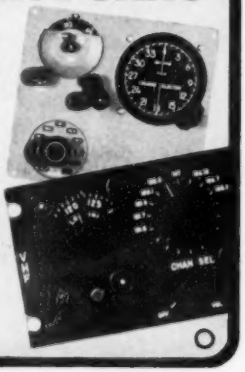


Atlantic Aviation CORPORATION

TETERBORO AIRPORT, TETERBORO, N. J.

Super Connie TWA Version

- Wing Span ..... 123 ft.
- Length ..... 113 ft., 7 in.
- Takeoff Weight ..... 120,000 lb.
- Landing Weight ..... 98,500 lb.
- Engines
  4 Wright C18-CB, 2,700 hp. ea.
- Speed ..... 318 mph. at cruising
- Payload ..... 23,750 lb.
- Range .....
  3,250 mi. with full payload still air at 20,000 ft.
- Passenger capacity .....
  64 seats, plus 7 lounge seats.
- Sleeping accommodations .....
  8 upper, 8 lower.
- Cargo capacity ..... 693 cu. ft.
- Miscellany: Passenger cabin is 83 ft. long, has 744 sq. ft. of floor space. Three lavatories are provided. Rectangular, picture-size windows measure 16 x 18 in. Air conditioning system can maintain comfortable cabin temperature with outside extremes ranging from +100 to −60 F. New AiResearch cooling system is capable of producing 16 tons of refrigeration equivalent to 320 home refrigerators. Individual foot rests and air vents are provided at each seat. Cabin color scheme is cream-beige-turquoise green. New center wing tank holds 750 gal.

cause of the muffling effect of the engines' turbines.

The new, seven-passenger lounge is popular, showing that air travelers do like to get up and move around.

Large, rectangular windows give excellent visibility. The foam rubber seats are comfortable—the reclining mechanism permits passenger to select an infinite number of reclining positions, not a few preselected stops. Every other pair of seats is rotatable to face aft.

Forward portion of the main cabin is convertible to eight berths, four upper and four lower.

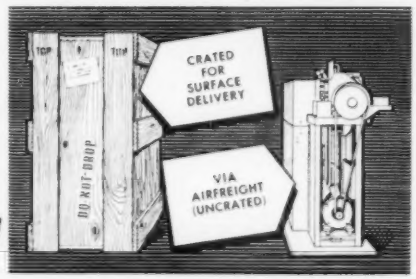
Lengthened forward compartment seats 16, has a small lavatory and its own entrance door.

Larger air conditioning system and improved air ducting are effective.

Stewardess control panel has been moved from the partition behind the left row of seats to the bulkhead behind the double jump seat provided for the girls. Panel contains controls for cabin heat and lights, and water heater. Cover pulls down to form compact writing deck.

► **Quick Escape**—An effective method for positioning the evacuation chute in the main cabin door is incorporated in TWA's 1049s. The chute is secured to a tubular, U-shaped frame which is hinged vertically to the fuselage just ahead of the main door. Chute and frame are normally kept out of sight in

Less Wait!
Less Crate!
Less Weight!



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'Flying Carry-All' for the Army Field Forces — Increasing numbers of Sikorsky H-19's are coming off production lines in the traditional olive-drab colors of the U. S. Army. They will be vital components of the Army's newly organized Helicopter Transport Companies which have the important assignment of giving logistic and tactical support for the ground forces.

In Army service, helicopters will be used for personnel and cargo transport, observation and reconnaissance, wire laying, courier service, evacuation of the wounded and all the other duties for which they have proved so indispensable in Korea.

Adoption of the Sikorsky H-19 by the Army has made its use unanimous with America's military services. Other modifications of this basic type helicopter have already been established as standard and important items of equipment with the Air Force, the Navy, the Marine Corps and the Coast Guard.

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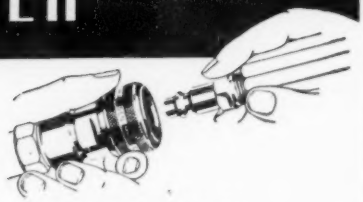

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To disconnect, pull back sleeve on socket—coupling disconnects. Flow is shut off instantly and automatically. No tools—no turning, adjusting nor twisting of parts required.

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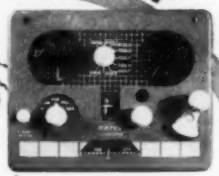

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Leighton Collins, Editor of Air Facts, has logged a comprehensive story, "5000 Miles by Omnigator," in Air Facts Magazine. He states, in summary, "A cross-country exploration and study of our elaborate omni-range and ILS facilities reveal that the system is incredibly good and that, for the first time, the small plane owner has something he can rely on in fair weather or foul, high or low, and especially in thunderstorm areas."

For a complimentary copy of this Omnigator story, write NARCO.

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Perfection in electronics

a stowage closet behind the last row of seats on the left side of the cabin. All that is required to eject the chute in case of emergency is to remove the closet cover, swing the frame through 90 deg. (width of frame is greater than door opening, so it cannot swing outside) and release the chute.

Added safety feature is an evacuation rope stowed in a compartment directly over the three entrance doors of the plane.

Toilet doors are the inconvenient fold-in-the-middle type which some other carriers have discarded.

A scanning window has been incorporated in the rear pressure bulkhead and a light installed in the unpressurized tail section of the airplane. This combination permits inspection of most of the elevator and rudder control cables and mechanism if required.

▶ **In the Cockpit**—Cockpit refinements include:

• **Better propeller control.** In previous Connies, the engines were synchronized by hand. In the Super Connie, one engine (either No. 1 or No. 2, at the flight engineer's discretion) is set manually to the correct rpm. Then a synchronizing button is pushed which automatically brings the other engines to the selected rpm. within a tolerance of 3%.

• **Alternating current power failure** warning indicators are provided for pilot and co-pilot to show loss of a.c. current to electrical flight instruments. Units are made by Eclipse-Pioneer.

• **Nesa glass** is used in the three forward-facing windshield panels. (Nesa is an electrically heated de-icing pane.) Heat is applied to the panels at all times during flight to increase the glass' impact-resistance. Nesa controls are given to the flight engineer.

• **Fire warning lights** for Zone I have been moved from the flight engineer's overhead panel to the 260 panel at his right arm. The warning system has been changed from a single-wire, series system to a two-wire circuit to make locating fires virtually fool-proof by making continuity checks possible.

• **Circuit breaker location** has been cleaned up and improved. All breakers associated with controls located on the 260 panel are grouped on that panel instead of being scattered about the flight engineer's station.

• **Generator overheat warning** indicators are a new installation, located at flight engineer's post. Offending units may be disconnected electrically.

▶ **De Luxe Flights**—TWA has inaugurated de luxe "Ambassador" flights with its 1049 equipment. Currently, the Super Connies make one transcontinental roundtrip a day. Flights feature Continental-type cuisine with a multiplate, after-the-theater buffet on the

THE COUNTRY'S **LARGEST** EXTRUSION PRESS...

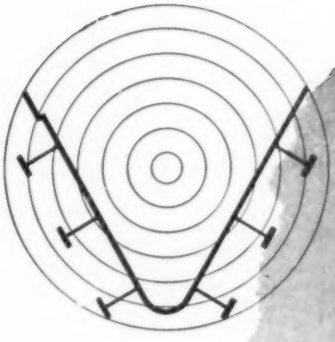
now being installed by Alcoa...

increases maximum extrusion size

from a 15-inch to a 23-inch

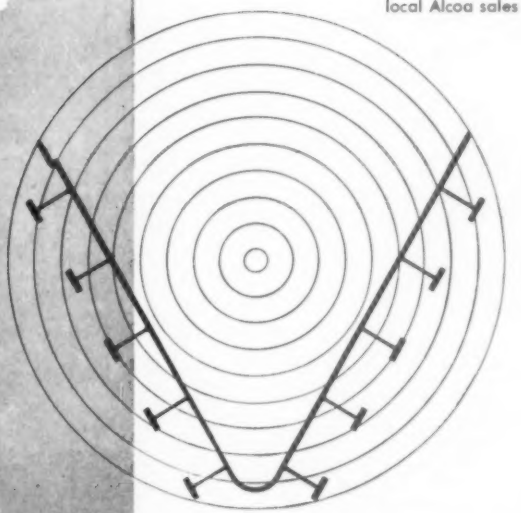
circumscribing circle, or from 600 pounds

to 2300 pounds per piece



The 13,200-ton squeeze of this press means that Alcoa extrusions can be larger, thinner, and more intricate than before. Ribbed extrusions for panels, for example, can be made, as illustrated, 34 inches wide—saving greatly in riveting and assembly.

For complete information call your local Alcoa sales engineer.



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A. W. Haydon precision timers help give hot wings to F-94. A specially designed program timer shunts three phase current in sequence through ten electrical heating elements in the leading edges of wing and tail.

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westbound flight and a seven-course dinner on the eastbound hop. As a compromise between most domestic flights which serve no liquor and such airlines as Northwest and National, which serve just about anything a person would like to drink, TWA's Ambassador flights serve only one drink—champagne.

A new and improved galley should help stewardesses serve hot meals quickly. Handy trays, popular with most airlines, attach to seat armrests, so passengers need not balance meals on their laps.

TWA has ordered a fleet of ten Super Constellations.

Dump Valves to Boost Scorpion Climb Rate

Northrop Aircraft's F-89C Scorpions are being fitted with tiptank dump valves. Rapid fuel release will permit a quick weight reduction for maximum rate of climb in short-range interception. F-89A and -B planes also will get the dump valves in service modifications.

Tiptanks on the F-89 are not jettisonable, but with dump valves, effect comparable to a tank-dropping action will be obtained.

Major portion of the Scorpion's fuel is carried in wing and fuselage tanks. Service ceiling is over 45,000 ft. and the craft carries six 20-mm. cannon. The plane is in operation with fighter-interceptor squadrons of the Air Defense Command's eastern, central and western forces.

Richfield Expansion To Up Avgas Output

Richfield Oil Corp. is planning a $40-million expansion of its refinery near Long Beach, Calif., that will boost production capacity for aviation gasoline almost three times.

The company says plans include a new fluid catalytic cracking unit as tall as a 16-story building, with larger capacity than any now on the West Coast.

Completion of the project in 1954 is expected to increase production capacity of aviation gasoline to more than 500,000 gallons a day, and crude-oil processing capacity to more than 125,000 barrels a day.

Tiny Parts Grinder

Greater precision in grinding extremely small holes and polishing bearings and other tiny components in miniature aircraft equipment has been made possible with development of

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but no Skid

Westinghouse Decelostat® Controller stops skids before they start

● Even on a slick, rain soaked runway you can slam on full brakes —without skidding—if you have Westinghouse Decelostat® Controllers. Every time a wheel slows down too fast the Decelostat® Controller immediately releases the brake—*before* the wheel stops completely and begins to skid. It reapplies the brake instantly when the skid danger is over.

You can actually stop *faster* with Decelostat® Controllers than if you locked the wheels and *skidded* to a stop; because its operation is tailored to the braking requirements of the particular plane on which it is used. The hazards of ground loop or over run are greatly diminished.

Decelostat® Controllers give you the priceless bonus of safer landings . . . and save you money too. A tire casing lasts longer and can be retreaded more often because the better braking pattern cuts down wear. Decelostat® Controllers more than pay for themselves in longer tire life.

For more information, write to Westinghouse Air Brake Company, Industrial Products Division, Wilmerding, Pennsylvania.

AIRCRAFT SECTION

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WRENCH SET

■ With Snap-on's Master set you're equipped for an exceptionally wide range of nut turning operations. The four Snap-on handles . . . Ratchet, Speeder, Spinner, Sliding Bar . . . with three extensions and universal joint, provide the utmost in wrench flexibility, speed, power . . . save time on straight-away jobs . . . quickly reach and turn difficult and "hidden" nuts. Supplied with full range of socket sizes, 7/16" to 1¼".

In thousands of plants Snap-on wrenches are used for production, assembly and maintenance. Write for the Snap-on Industrial Catalog, and general catalog of 4,000 Snap-on hand and power tools.

SNAP-ON TOOLS CORPORATION
8020-J 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation

what Chicago Wheel and Mfg. Co. calls the "world's smallest commercial mounted wheel." The company claims it could find none smaller.

The wheel is ☆ in. in diameter, a tiny power-driven model carrying abrasive.

"Exact duplication of even the most minute parts is possible . . ." by use of this wheel, the company says. And it claims the accurate finish on parts thus produced should enhance the performance of the equipment they are used in, such as radar gear and aircraft instruments.

Chicago Wheel and Manufacturing Co., 1101 West Monroe St., Chicago 7, Ill.

OFF THE LINE

A one-year contract has been awarded to Socony-Vacuum Oil Co., Inc. by the Armed Services Petroleum Purchasing Agency to provide service and supply aviation fuel and oils for U.S. government aircraft. Contract covers 19 foreign airports at such localities as Anglo-Egyptian Sudan, Cyprus, Lebanon, Saudi-Arabia and Senegal.

A $2-million equipment contract has been awarded Surface Combustion Corp., Columbus, Ohio, for devices, listed as secret, to go into Northrop's twin-jet, rocket-firing F-89D Scorpion interceptor.

Lockheed Aircraft Service—International is busy making up 750 kits to install Bendix-Scintilla ignition analyzers in B-29 aircraft. Kit includes brackets to support analyzer components and Barry shock-resistant mounts for the analyzer itself. Some cabling is included. The airborne analyzer will be installed in the radio rack next to the flight engineer's station. Kits are scheduled to be delivered from October 1952 to February 1953.

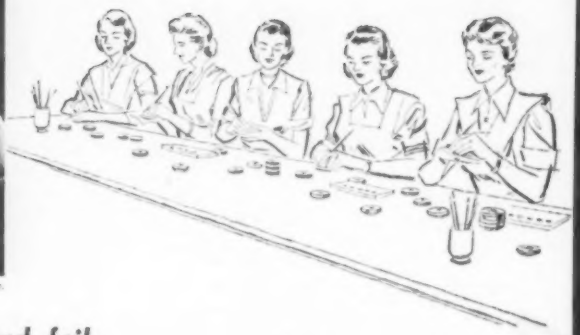
British and Japanese experts have begun negotiations in Tokyo on a civil air transport agreement, including air routes, emergency landing procedures and entry and exit methods. Also to be covered is question of British planes operating on domestic services in Japan.

Probably the only aircraft overhaul docks in the world made out of Philippine mahogany stands in Philippine Air Lines' maintenance hangar in Manila. The wood is cheap there. Docks were modeled after United Air Lines' units in San Francisco.

Southwest Airmotive Co., Love Field, Dallas, has been appointed a dealer for Magnolia Petroleum Co. Southwest

Multi-colored plastic ornaments on automobiles were hand painted luxuries a few years ago. Now, with the help of a bit of Silastic, they are mass produced to decorate even the least expensive models.

Courtesy Bay Mfg. Div., Electric Auto-Lite Co.



as a die for hot-stamping pigmented foil

SILASTIC* works

where other materials fail

One of the problems in developing this process was to find a material for hot-stamping pigmented foil. Specifications called for a die-tip that would remain resilient and not stick to the foil after thousands of impressions at surface temperatures in the range of 500° F.

After trying many materials, that problem was solved at the Electric Auto-Lite plant by using Silastic. For more than 3 years the same Silastic tips have been used, and none of them has worn out, lost its flexibility or peeled off its metal backup plate.

Retention of rubbery properties at temperatures ranging from −100° to over 500° F makes Silastic unique among rubberlike materials. Combine such stability with excellent resistance to oxidation, to outdoor weathering, and to a variety of hot oils and chemicals, and you have one of the most useful of gasketing and sealing materials. Combine those with good dielectric properties, and you have an ideal insulating material for transformers and traction motor field coils, Navy control cable, and ignition cable for aircraft and ordnance vehicles.

*T. M. Reg. U. S. Pat. Off.

FIRST IN SILICONES

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

Silastic may be the rubbery material that can solve your production problem or give your product a profitable sales advantage. Mail this coupon or call our nearest branch office.

Dow Corning Corporation, Dept. D-22, Midland, Mich.

Please send me:

☐ Silastic Facts 10a with new data on properties and applications of all Silastic stocks and pastes.

☐ "What's A Silicone?", your new 32-page booklet on silicone products and applications.

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JET ENGINEERING

...a challenging opportunity

Jet Engineering means more than a profession — it means pioneering a new industry.

Only 10 years ago General Electric produced the first American jet engine. Since then jet power has revolutionized aviation, and G.E. has become one of the largest jet engine builders in the world.

The future of the jet engine is practically limitless. For example, the market for jet transport aircraft has only been scratched. Today, the world's airlines are preparing for the new era of jet powered air travel.

General Electric Aircraft Gas Turbine Division offers an engineer unusual opportunity to shoulder responsibility. Here, an engineer's progress is limited only by his own ability.

This is your opportunity for a permanent career in a progressive new industry. We invite you to match your qualifications with the challenging assignments listed below.

POSITIONS AVAILABLE IN JET ENGINEERING

CREATIVE MECH. DESIGN	TESTING	SERVO MECHANISMS
STRESS ANALYSIS		HYDRAULICS
VIBRATION AND DAMPENING	HEAT TRANSFER	LUBRICATION
AERODYNAMICS	ENGINE AND	ELECTRONICS
FLUID MECHANICS	REACTOR CONTROLS	THERMODYNAMICS

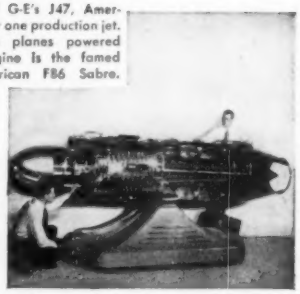
Positions are available at West Lynn, Mass. and Lockland, Ohio. Please do not apply if your best skills are being used for vital defense work. Send your resume to: Technical and Supervisory Personnel, Aircraft Gas Turbine Division, Dept. A.

GENERAL ELECTRIC

P.O. BOX 196 CINCINNATI 15, OHIO

Boeing B-47, shown in rocket-assisted take-off. Powered by six G-E engines, the B-47 is the fastest known bomber in the world.

Cutaway of G-E's J47, America's number one production jet. Among the planes powered by this engine is the famed North American F86 Sabre.



G-E engineer congratulates Air Force technician on new engine performance record. G-E jet engineers maintain close contact with engine operation in the field.

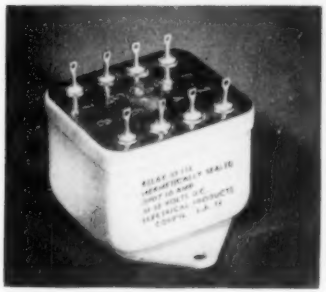
G-E engineers examine model of new turbojet. Group conferences such as this are standard procedure in the development of G-E jets.

This modern engineering and administration building is the hub of all activities at G-E's jet center.

expects to dispense nearly 3 million gal. of gas this year. It also is the new home base for the "Red Horse Force," Magnolia's eight company-owned aircraft, ranging in size from Luscombe to DC-3.

United Air Lines wants more accurate timing of Scintilla ignition analyzers to the engine, Norm Davis, UAL engineer says. He quotes 3° as the maximum acceptable tolerance. Scintilla spokesmen admit that accessory drive gear back-lash is a big problem. They suggest that it would be desirable to build a timing device into the engine, but concede such a scheme is not practical on existing engines.

NEW AVIATION PRODUCTS



Small Relay

A new aircraft relay, claimed to be one of the smallest and lightest of its rating, has been placed on the equipment counter by Electrical Products Corp.

Designed to meet Spec. MIL-R-6106, the unit is rated at 10 amp. and can be used for operation on 28-v. d.c. or 115-v. a.c. 1400-c. current. It weighs 4.8 oz. and is a double pole-double throw type.

The same rotary armature structure and contact linkage that is AN-approved for larger enclosures is used in the part. Company officials say the relay has been vibration tested for 1 million cycles of operation and has withstood a 125G shock load without damage. When tested at 200G, the mounting base was slightly damaged, but the relay itself was unhurt, the firm reports.

Electrical Products, Corp., Relay division, 1100 N. Main St., Los Angeles 12.

Impact Tester

Instruments specially developed to test sensitive aircraft components under impact are being produced by Mantec,

STACKPOLE *Brushes*

HELP PLANES GO HIGHER . . . MORE DEPENDABLY

From altitudes of 30,000 feet—then to 40,000 feet—and now to 50,000 feet and higher, Stackpole has set the pace in aviation generator brush dependability. The same revolutionary principles that enabled Stackpole to increase high-altitude brush life more than 80 to 1 during World War II have steadily been improved, refined and adapted for long-life commutation at higher and still higher altitudes.

As the acknowledged leaders in this essential phase of aviation progress, Stackpole brush engineers offer a wealth of highly specialized "know how" in helping planes probe still farther into the wild blue yonder—*dependably.*

MORE AMPS. PER SQUARE INCH!

Typical of Stackpole high-altitude brush progress is the fact that, on certain applications, current densities of 500 or more amperes per square inch can be carried for short periods on Electro-Graphitic brushes. Normal industrial brush uses seldom call for more than 75 amps. per square inch!

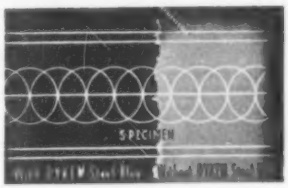
STACKPOLE CARBON COMPANY, St. Marys, Pa.

BRUSHES FOR ALL ROTATING ELECTRICAL EQUIPMENT • CARBON, GRAPHITE AND PRECIOUS METAL CONTACTS • CARBON RHEOSTAT PILES CLUTCH RINGS • FRICTION SEGMENTS • SEAL RINGS • WELDING CARBONS
and dozens of carbon and graphite specialties

DYKEM STEEL BLUE *STOPS LOSSES*

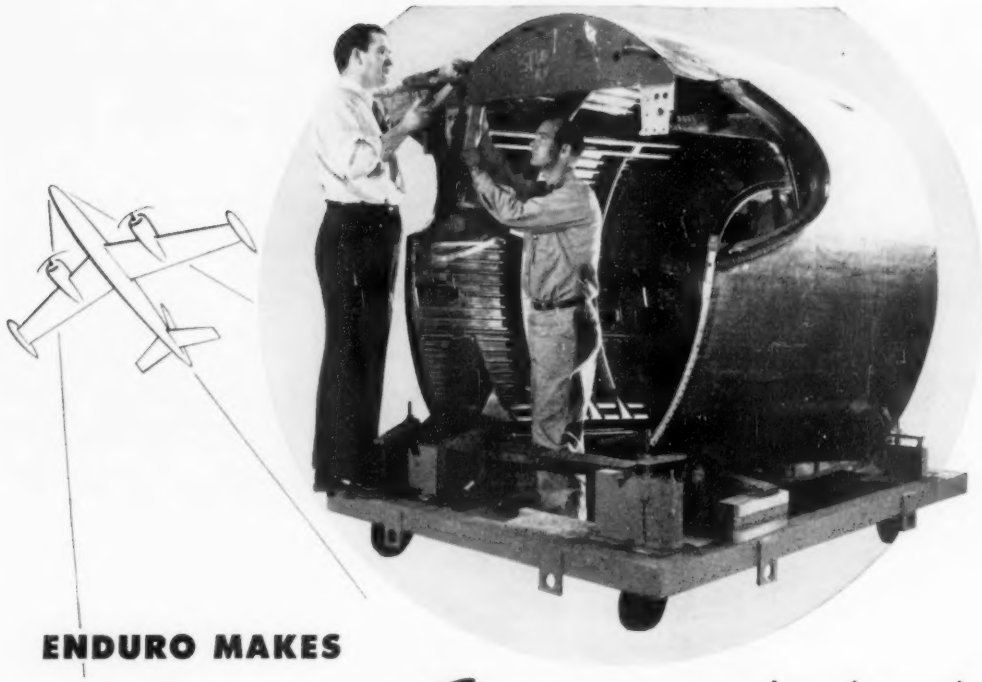
making dies and templates

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.



Write for full information

THE DYKEM COMPANY 2303A North 11th St. St. Louis 6, Mo.



ENDURO MAKES AIRCRAFT NACELLE *Stronger* YET *Lighter!*

The first all-stainless steel aircraft engine nacelles now are being built of Republic ENDURO. This smooth-skinned barrel nests into wing sections of the Lockheed P2V "Neptune"—the U. S. Navy's new submarine search-killer. Within each 175-pound nacelle hangs a 3500-pound Wright Turbo-Cyclone engine.

To take the shock of bang-down landings of this heavy ship with its heavy engines, Lockheed designers turned to stainless steel for increased structural strength without added weight. For maximum strength, Solar Aircraft Company, builders of the nacelles, used an extremely strong form of ENDURO.

But, full hard stainless steel in very light gauges posed several special production problems. Today Solar reports, "On several major components of this unit, Republic worked closely with us all along the line. Their help and cooperation enabled us to transmit needed information and eventually lick the problem of obtaining full hard parts to meet Solar's high quality control demands. We are particularly grateful for Republic's cooperation."

Here, the use of cold formed stainless steel gave required strength together with an actual definite weight saving as compared with previous designs. What ideas have you for utilizing ENDURO's high physical and chemical properties to increase strength and to save weight? Republic metallurgists are ready now to work with you on any aircraft applications involving the use of stainless steel. Contact them through your nearest Republic District Sales Office, or write:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Building, New York 17, N.Y.

NOW . . . SEE AND HEAR "THE STORY OF STAINLESS"

FULL-COLOR, 16 MM SOUND FILM—27 MINUTES RUNNING TIME

Dramatic . . . historic . . . interesting. Available to qualified groups without charge. Requires 16 mm sound projector. Send name of organization, type of projector, requested date to Ideal Pictures Corp., 65 E. So. Water Street, Chicago 1, Illinois, or write Republic Steel, Dept. K, Cleveland 1, Ohio.

Republic
REPUBLIC STEEL
ENDURO STAINLESS STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

Inc., El Segundo, Calif.

These shock test instruments, with a capacity of 750-lb. force (10 lb. at 75G), are made in conformance with JAN-S-44. Special springs can be supplied to alter G impact loads. They test aircraft relays, instruments, motors, switches and other components in accordance with enviromental test requirements of USAF 41065-B and MIL-E-5272. A typical unit is 50 in. high and weighs 300 lb.

Mantec, Inc., El Segundo, Calif.

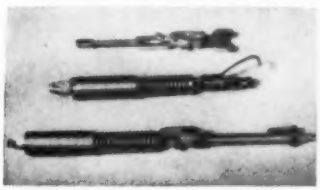
Gunsight Heater

Ring heaters are being produced by Vulcan Electric Co. for the Air Force to provide correct operational temperature control on gyros in gunsights.

Easy installation and concentrated heat are two advantageous factors of the heaters which are electrically operated. They can serve both as space and contact heaters and can be used for a number of applications.

Two main types are a rust-resistant steel sheath for temperatures up to 750F and a stainless steel model for 1,200F operation. Wattage runs from 75 to 800 for the former, 100 to 1,000 for the latter. There are six standard sizes, from 2 in. o. d. and ¼ in. thick to 6 in. o.d. and 5/16 in. thick.

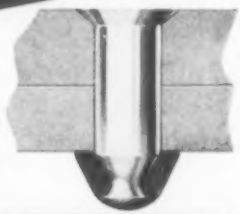
Vulcan Electric Co., Danvers, Mass.



Seat Locks Tested

To stop passenger complaints arising from failure of seat recline mechanisms, leading airlines are testing three new seat locks for use in Boeing Stratocruisers, DC-6s, and Convair-Liners (top to bottom, first photo). A fourth unit is being tested by Air Force to take 16G loads on aft-facing seats. All models are mechanical Burns Locks, use simple parts, yet designed to provide smooth operation of hydraulic locks. Passengers won't be frustrated by jammed or creeping seats with these new units which weigh less and are interchangeable with locks now in use, according to developer, Burns Aero Seat Co., Burbank, Calif.

Heat Treated Alloy Steel Pin with Malleable Aluminum Collar



REGULAR, CLOSE TOLERANCE AND INTERFERENCE FIT TYPES MANUFACTURED FROM ALLOY STEEL, STAINLESS STEEL AND 75ST ALUMINUM ALLOY

Hi-Shear Rivets of all types—in a full range of sizes are available through Pheoll's extensive manufacturing facilities . . .

NAS 177	100° Countersunk Head
NAS 178	Flat Binding Head
HS 2R7	Close Tolerance 100° Countersunk Head
NAA 2R6	Stud Rivets
HS 11	Brazier Head
HS 23	Close Tolerance 100° Countersunk Head—75ST Aluminum Alloy
HS 26	Flat Binding Head—75ST Aluminum Alloy
HS 27	Close Tolerance 100° Countersunk Head—Close Tolerance Shank
HS 28	Flat Binding Head—Close Tolerance Shank
HS 37	Close Tolerance 100° Countersunk Head—Close Tolerance Shank—Minimum Tensile Strength 160,000 p.s.i.
HS 38	Flat Binding Head—Close Tolerance Shank—Minimum Tensile Strength 160,000 p.s.i.
HS 47	Close Tolerance 100° Countersunk Head—Interference Fit—Minimum Tensile Strength 160,000 p.s.i.
HS 48	Flat Binding Head—Interference Fit—Minimum Tensile Strength 160,000 p.s.i.

Other Types of Hi-Shear Rivets made to customer's specifications. Aluminum Collars for all styles of Hi-Shear Rivets. Also Hi-Shear Rivets for industrial applications.

THE Hi-Shear Rivet consists of a hardened pin and a malleable aluminum collar. Driving may be done from either end. A simple one-piece rivet set is fitted to the conventional rivet gun (or is used as part of the bucking bar), or a pneumatic squeezer may be employed. As the collar is forced into the groove at the end of the pin, a ring of waste material is pinched off and automatically ejected, leaving a smooth low-rounded head.

FREE CATALOG and Engineering Data Sheets, Available on Request.

Time Reducing Features and Advantages

- Adaptable to high-speed riveting of even larger sizes than practical with soft rivets.
- Quick and positive visual inspection. No guess work as to proper installation. Gages or other checking devices not needed.
- No sharp edges or excessive protrusions. Protruding head and collar end are low and smooth.
- Work quickly drawn together. The collar opposes the rivet head and acts as own draw set—automatically draws the work together—instantly—firmly.

PHEOLL MANUFACTURING COMPANY

SCREWS BOLTS

WESTON
Navigation
INSTRUMENTS
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INSTRUMENTS
Special purpose
INSTRUMENTS
Test equipment
CORRESPONDENCE INVITED
WESTON
Aircraft Instruments
WESTON ELECTRICAL INSTRUMENT CORPORATION
617 Frelinghuysen Avenue, Newark 5, N. J.

Ryan Ceramics Gage

An instrument that is claimed to measure the thickness of ceramic coatings on flat or curved engine parts with hairline accuracy, has been produced by Ryan Aeronautical Co. It was conceived originally by National Bureau of Standards.

The gage is expected to permit more accurate analysis of the effect of heat on ceramics and better quality control of production coatings. It is accurate to within .0005 in.

The instrument is being used by Ryan researchers to analyze coatings on company-made parts that are in actual airline service. They feel they have "a rich field to assay," with more than 2,000 hr. accumulated already on Pratt & Whitney R-4360 engine headers on Boeing Stratocruisers. These are coated with Ryan ceramics.

Ryan Aeronautical Co., Lindbergh Field, San Diego, Calif.

Marker Beacon Unit

Lear, Inc., has widened its line of radio equipment with the introduction of a new 75-mc. marker beacon receiving unit.

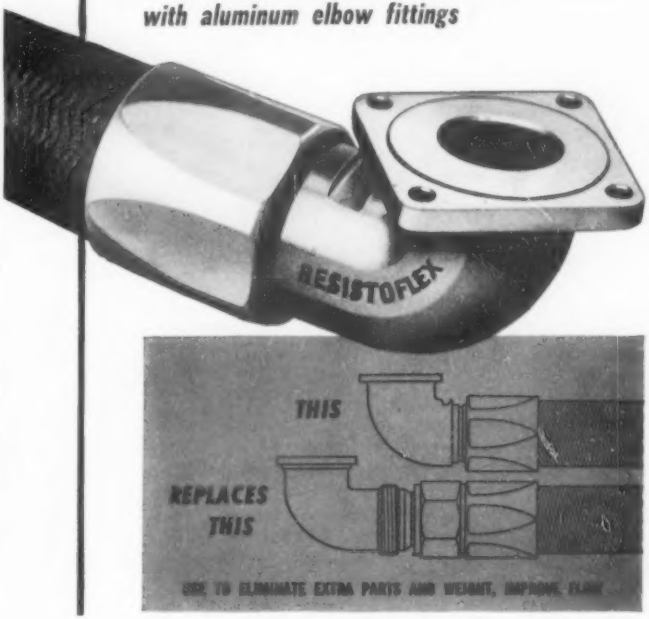
Called the Model 2200, it is designed to fill the needs not only of light aircraft, but of heavy, multi-engine aircraft operators as well. It carries CAA Radio Type Certificate 6R16-1. Both visual and aural output can be utilized. An exclusive feature, says Lear, is that the receiver can operate a loudspeaker directly. Three lights, adjustable for intensity, one each for outer, middle and inner marker beacon signals, are installed on a small unit that mounts directly to the instrument panel. This is the de luxe model.

A simpler, lower-priced receiver is available with aural output only. Both models have a simplified single-clamp shock mount, can be operated on 12- or 24-v. systems. Sensitivity is adjustable from 500 to 20,000 microvolts for lamp operation. Selectivity is 2.75 mc. at 60 db., audio output power 200 milliwatts, and output impedance 500 ohms and 3.2 ohms.

Learcal division of Lear, Inc., 11916 W. Pico Blvd., Los Angeles 64.

no adapters needed

when you use RESISTOFLEX hose assemblies with aluminum elbow fittings



■ A Resistoflex hose assembly using *integral elbow fittings* is completely interchangeable with the heavier combination of hose assembly plus adapters. It can help you eliminate needless parts and weight. *Fewer threaded connections also reduce risk of leakage.*

Machined from solid forgings of higher strength aluminum, Resistoflex hose fittings resist vibration and fatigue. Their true bends and smooth interior finish promote full flow with less turbulence or pressure drop. Elbows are compact – fit into tight spots with ample wrench clearance.

See dimensional and test data in the Resistoflex Aircraft Catalog – write and tell us how many copies you want.

Engine Designers! **Plan to use Resistoflex fittings that now carry U.S.A.F. and "BuAER" approval**

RESISTOFLEX

CORPORATION
Belleville 9, New Jersey

NEED TEFLON® or KEL-F® with optimum properties? Then ask us also for bulletin on "FLUOROFLEX" products

Today's knights with flashing *Sabres* fight high in the sky, with speed and maneuverability that would be impossible without structural components which produce *maximum strength* with *minimum weight*. For such components, North American Aviation, Inc.—makers of the F-86E Sabre (latest version of the Air Force F-86 which holds the official world's speed record)—uses OSTUCO Aircraft Tubing.

The majority of leading aircraft manufacturers use OSTUCO Tubing, because of *favorable strength without weight characteristics* and *specialized forming and machining qualities* that make it ideal for landing gear, fuel lines, and many other applications.

OSTUCO Aircraft Tubing meets all Army, Navy, and AMS specifications. Send for free Handbook A-2 packed with facts for ready reference on OSTUCO Aircraft Tubing. Airframe Stock List (revised bi-monthly) also available. Address your nearest OSTUCO Sales Office or write direct to General Office, Shelby 1, Ohio.

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Good Risks

- **Report indicates aviation insurance profitable.**
- **$109 million in premiums paid in five years**

Coverage of aviation risks has proved quite profitable to insurance companies writing this type of protection. That is one of the major indications in a current report released by the Insurance Department of the State of New York.

Under review was the Aviation Insurance Rating Bureau, licensed under the New York State insurance law. It is also licensed as a rating bureau in California, Montana, New Jersey, and North Carolina. Aviation insurance in other states is excluded generally from the rating laws.

▶ **Insurance Organization**—Membership of this rating bureau consists of 61 separate insurance companies represented by the Associated Aviation Underwriters. This group writes insurance for about eight of the trunklines, representing the greatest segment of the industry.

The Aviation Insurance Rating Bureau promulgates rates for aircraft hulls, aircraft passenger liability, aircraft bodily injury liability, aircraft property damage liability and employers' aviation indemnity. The Bureau is a voluntary non-profit organization and serves, among other things, to:

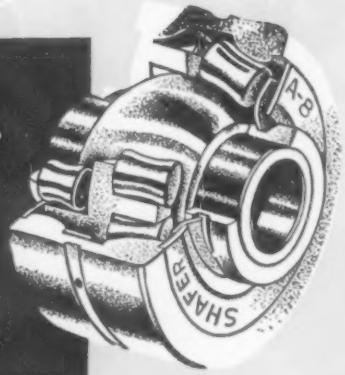
> Establish and administer plans to compile . . . complete, accurate and up-to-date statistical data for use . . . in the establishment of underwriting rules, classification of risks, rating plans, rates or premiums and collect and analyze experience.

Aviation insurance premiums are big business and range anywhere from $40,000 to $3 million per year for individual airlines. A measure of competition is afforded in that there are four principal markets or groups:

Associated Aviation Underwriters,
U. S. Aviation Insurance Group,
Aero Associates, and
Lloyds of London.

The table on page 87 reveals the volume of insurance premiums written as well as loss experiences of Associated Aviation Underwriters members in the principal categories for the five years ended December 31, 1950. During this period more than $109 million in in-

MITES IN SIZE...
MIGHTY IN SERVICE



ConCaVex is the "years ahead" design in aircraft control bearings. Developed and pioneered by Shafer over 3 decades ago it has met the requirements of aviation's every forward step. ConCaVex design provides a bearing of unique space-saving, weight-saving compactness . . . unmatched shock and load capacity . . . 20° integral self-alignment . . . positive contact seals and reserve strength to spare. Types and sizes for all airborne craft—military or commercial. Write for descriptive literature.

SHAFER BEARING CORPORATION
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DOWNERS GROVE, ILLINOIS

Full line of ConCaVex Industrial Bearings, too! Full information on request.

Short Cuts

to perfection at PIPER

CAUTION!
JAGGED EDGES!
Over rough aluminum pointers, PERMACEL 66 Cloth Tape provides smooth surface for fabric covering, bars rips.

ENGINEERS DEPEND ON

Permacel® and Texcel®

From bare-frame to finished plane, they use **PERMACEL** or **TEXCEL** every step of the way at Piper Aviation. And not for the short cuts alone—but also for the more *dependable* jobs they get with these pressure-sensitive tapes. In wiring, riveting, masking, expediting—in all types of manufacturing—**PERMACEL** and **TEXCEL** speed production, cut costs. Let our sales engineer show you how.

TEXCEL TAPE

INDUSTRIAL TAPE CORP.
NEW BRUNSWICK, NEW JERSEY
Makers of PERMACEL and TEXCEL pressure-sensitive tapes for industry.

PERMACEL

ENGINEERS—

Here is North American's Challenge To You

Frankly, working at North American requires hard thinking and plenty of vision. Because North American always works in the future. Yet, if you are interested in advanced thinking, if you'd like to work on the planes that will make tomorrow's aviation history, you'll like working at North American. North American offers these extra benefits, too.

North American Extras—

Salaries commensurate with ability and experience • Paid vacations • A growing organization • Complete employee service program • Cost of living bonuses • Six paid holidays a year • Finest facilities and equipment • Excellent opportunities for advancement • Group insurance including family plan • Sick leave time off • Transportation and moving allowances • Employees Credit Union • Educational refund program • Low-cost group health (including family) and accident and life insurance • A company 24 years young.

Write Today

Please write us for complete information on career opportunities at North American. Include a summary of your education, background and experience.

CHECK THESE OPPORTUNITIES AT North American

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- Stress Engineers
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- Specialists in all fields of aircraft engineering
- Recent engineering graduates
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NORTH AMERICAN AVIATION, INC.

Dept. 10, Engineering Personnel Office
Los Angeles International Airport
Los Angeles 45, Calif.; Columbus 16, Ohio

North American Has Built More Airplanes Than Any Other Company In The World

Aviation Insurance Experience

Five Years to December 31, 1950
(Direct Business Only)
Aviation Insurance Rating Bureau

Policy Year	Net Direct Premiums Earned	Incurred Losses Including Allocated Claim Expense	Loss Ratio %
Hull Ground Coverages			
1946	$6,038,150	$4,581,717	75.88
1947	5,714,682	5,147,813	89.08
1948	5,449,869	2,084,622	38.25
1949	5,111,804	1,235,045	24.00
1950	*2,811,149	520,290	18.51
Total	**$25,125,654**	**$13,570,087**	**54.01**
Hull Crash Coverages			
1946	$8,687,694	$7,139,958	82.18
1947	8,538,552	5,752,258	67.37
1948	8,328,640	5,209,749	62.55
1949	8,414,366	3,631,131	43.15
1950	*5,203,829	1,803,798	34.66
Total	**$39,173,081**	**$23,536,894**	**60.01**
Aircraft Passenger Liability			
1946	$4,328,421	$4,038,680	93.31
1947	4,798,859	4,052,580	84.45
1948	4,548,114	1,843,132	40.53
1949	4,240,351	3,055,503	72.06
1950	*3,312,804	1,330,085	40.15
Total	**$21,228,609**	**$14,319,989**	**67.46**
Aircraft Public Liability			
1946	$813,084	$246,238	30.25
1947	1,030,514	243,414	23.62
1948	911,185	308,587	33.87
1949	805,447	240,477	29.80
1950	*530,271	59,802	11.29
Total	**$4,091,491**	**$1,098,608**	**26.85**
Aircraft Property Damage Liability			
1946	$819,623	$461,576	56.32
1947	966,330	473,393	48.99
1948	994,908	398,002	40.00
1949	944,272	980,800	103.87
1950	*632,743	222,124	35.10
Total	**$4,357,876**	**$2,535,895**	**58.19**
Personal Accident (Individual & Group)			
1946	$1,985,261	$770,349	38.80
1947	2,260,757	1,075,354	47.38
1948	2,422,812	1,000,352	41.29
1949	2,469,371	878,488	35.58
1950	*1,912,950	739,772	38.67
Total	**$11,060,151**	**$4,464,315**	**40.36**

* Estimated Earned Premiums.

SOURCE: Insurance Department State of New York, **1952.**

surance premiums were paid by about eight trunk airlines for the indicated protection.

▶**Loss Premium Ratios**—In the largest category, hull crash coverages, the average loss ratio for the five years amounted to 60%. Insurance premiums more than covered incurred losses in the bad accident years of 1946 and 1947. Significantly, this loss ratio declined sharply during the last three years for the three major categories; hull ground coverage, hull crash coverages, and aircraft passenger liability. For 1950, for example, the loss ratio in hull ground coverage was only 18.51%.

In only one instance during the five-year period have losses surpassed insurance premiums in any category and then but by a small degree. This is in aircraft property damage liability for 1949.

• In commenting on the experience of aircraft public liability coverage the

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New York State examiner noted that the loss ratio for seven years was 26.1%. Eliminating airlines' and factories' risks produced a loss ratio of 24.9%. The examiner then concluded:

> "In view of the consistently good experience for the seven years, it is recommended that aircraft public liability rates for bodily injury in the rating plan be reduced."

This recommendation was countered with a statement by the manager of the Rating Bureau to the effect that:

> ". . . in aviation insurance, for many cogent reasons which are readily apparent and need not be detailed, loss ratios over a comparatively short period of time do not carry the same connotation, significance and weight as in the insurance business generally . . . inclusion of the recent Elizabeth, N. J., and Jamaica, N. Y., losses in the experience could result in a five-year loss ratio well over 50%."

On the whole, aviation loss experience indicates that while the cost of this protection is coming down, it continues to represent an appreciable factor in the operating expenses of the airline industry.—Selig Altschul

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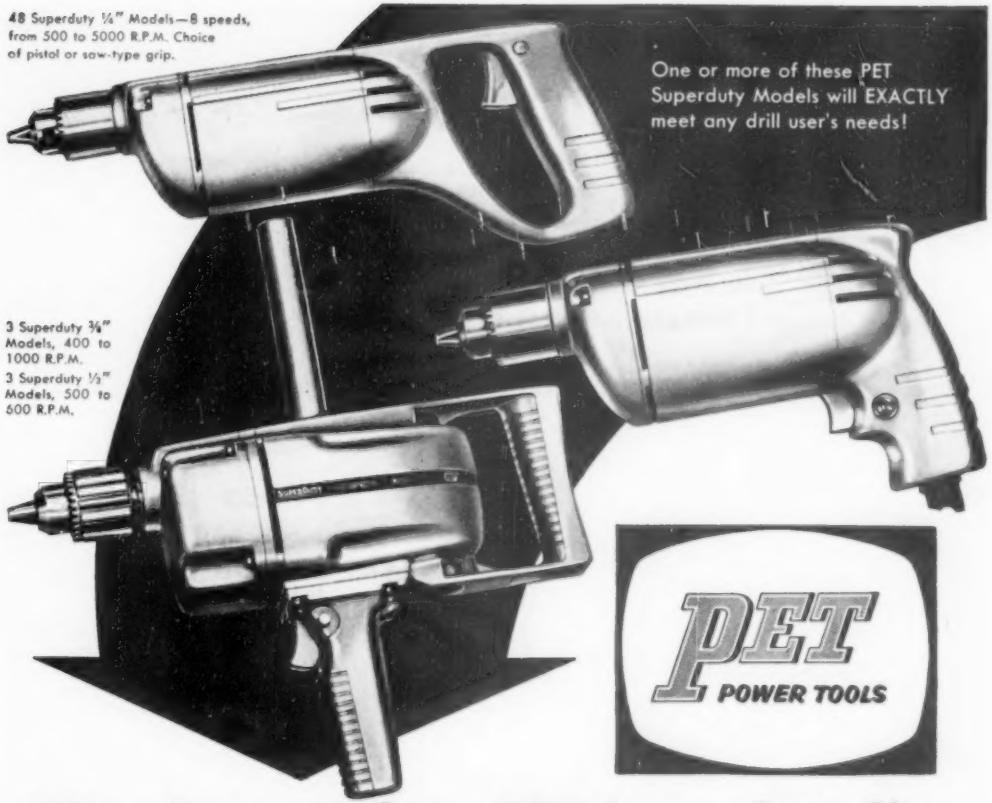
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Big Future Forecast for Intercity Copters

- **Piasecki predicts use of large transports by '57.**
- **But better heliports and navigation aids needed.**

The helicopter can start replacing fixed-wing Convairs and Martins on routes up to 350 mi. distance by 1957. That is the primary message of a Piasecki Helicopter Corp. paper presented to the SAE by board chairman F. N. Piasecki and special projects engineer L. S. Wigdortchik.

But how soon before 1960 the big multi-engine copters actually invade municipal and intercity air routes depends on how fast necessary airway and heliport facilities and techniques are prepared, the paper states.

Bell and Sikorsky also are pushing plans for large commercial copters.

Here are highlights of the Piasecki analysis:

Intercity travel time from downtown to downtown by a 125-mph. copter will compete with fixed-wing craft up to 260 mi. distance. The 150-mph. copters coming next will beat the fixed-wing plane up to 365 mi. "Further development . . . to a cruising speed of 200 mph. could extend the helicopter's speed advantage up to the 500- and 600-mi. stage distance."

On a 200-mi. intercity distance, the 125-mph. copter takes 1 hr., 55 min.; this is 33 min. faster than connections, limousine and air time for a trip in a plane that cruises at 250 mph., it is claimed. As speed and economy grow, the copter not only will invade the conventional shorthaul airline market but will divert more travel from train, bus and auto, the paper says.

▶ **Costs**—Customer cost on conventional copters of 40 seats or more will be from 6.8 to 8.8 cents per passenger-mile, Piasecki says. This is competitive with present fixed-wing air travel on short hauls, which is assumed at 6.8 cents per passenger-mile before limousine charges of $2 assumed at each end, which on a 100-mi. trip makes fixed-wing travel cost 8.8 cents. Hence, Piasecki believes, copters will be as cheap as the plane, and faster.

Here are cost comparison assumptions by Piasecki:

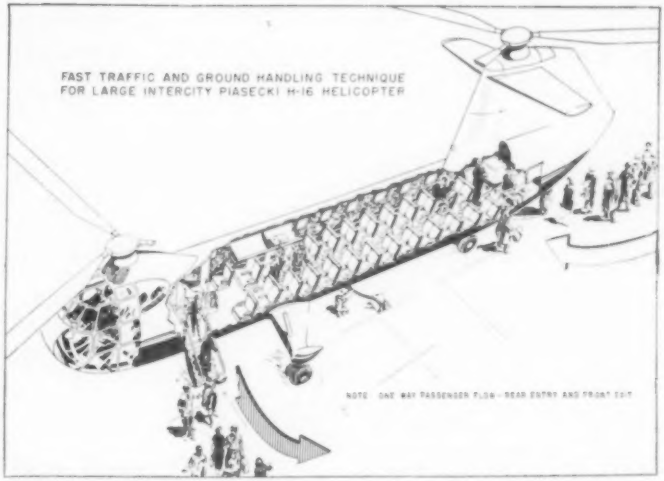
• **Initial cost** slightly higher, per passenger-seat, because of the mechanical transmission and rotor system, but simpler structure, landing gear and equipment systems should almost offset that.

• **Utilization** should be higher because of shorter time on ground, and its greater speed, broadening the shorthaul market, should also lengthen the air travel day—induce passengers to use it earlier and later in the day.

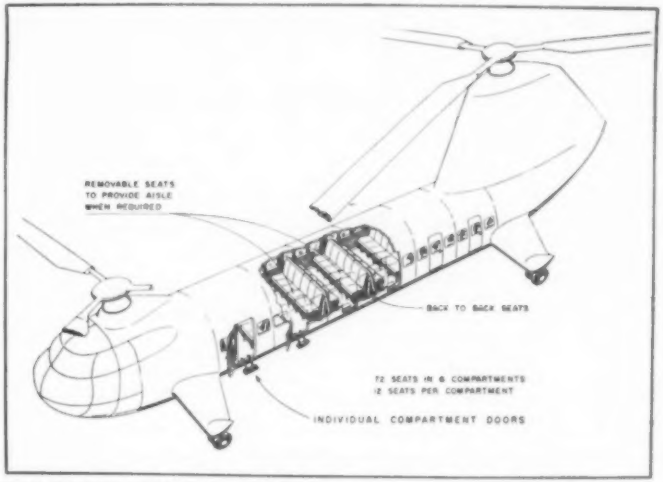
• **Depreciation time** should be about equal.

• **Insurance** should be higher at first, but "eventually" be lower because the copter "will be found inherently safer than the airplane."

• **Maintenance of copters** on regular schedules now requires higher proportion of manhours and replacement



GROUND-HANDLING TECHNIQUE cutaway view shows two-abreast seating, while . . .



HIGH-DENSITY ARRANGEMENT seats six abreast, like European railroad car.

parts, but "with provision for rapid replacement now incorporated in current production helicopters, and with fewer specialized systems in helicopters, the overall maintenance manhours per hr. of flight should be similar to that of airplanes."

• **Hourly productivity** above 100-mi. distance is less than the airplane because of the slower ramp-to-ramp speed.

• **Traffic staff** should be considerably less. "The airplane pays a high price in traffic due to the duplication at downtown centers and airports."

• **Landing fees** will be less at heliports than at airports. Heliports are smaller and simpler and charges should be correspondingly less.

Thus, says Piasecki, copters' direct costs per ton-mile will be higher, but indirect costs "can certainly be lower."

▶ **Other Advantages**—Copter advantages on short hauls include:

• **Speedier** than any other form of transport, including the train.

• **Safer than planes and autos.** Simple navigation, slow approach speeds and improving mechanical reliability will make this so, Piasecki contends.

• **More regular than planes.** Regularity and punctuality are bound to be better than planes' because copters are less affected by low weather ceiling. Lack of punctuality has been a major deterrent to short-haul air travel.

• **Convenience** of no-change service will be "nearer that of the railroad than that of the airplane, and also should achieve reduction of reservation methods."

• **Public acceptance** is untested, but Piasecki voices faith that "the public feels the helicopter to be safer than the airplane."

▶ **Copter Problems**—Before the copter can move in on the longer (up to 350 mi.) air routes this decade, the airlines, manufacturers and CAA must answer some current riddles. Main unresolved problems include all-weather navigation facilities, takeoff engine-failure safety criteria and consequent heliport design requirements. Other problems include arrangement of transport copter seating, baggage, exits and ticketing.

• **Navigation.** Air Navigation Development Board is planning an experimental program to develop copter landing and blind flight equipment and techniques. Copter autopilots installed so far do not have "fail-safe" characteristics. The present high-frequency navigation aids are not always effective behind buildings and hills.

• **Engine failure.** CAA has proposed that copters be able to climb at a rate of 1 ft. altitude in 20 ft. forward travel with one engine out. This is about 250-400 ft. per minute, depending on speed. This hurts payload capacity and requires sizeable heliport takeoff area.

Bonanza Strikes Gold on Coast

Comparative newcomer is real threat to big airlines; its fight with WAL may alter CAB policy on feeders.

By William J. Coughlin

Las Vegas, Nev.—Western Air Lines' long dominance of the lush Pacific Coast resort trade has been challenged by the comparative newcomer in commercial aviation, fast-growing Bonanza Air Lines.

The fight between Western and Bonanza has touched off side issues involving United, TWA, American and Southwest, has brought Civil Aeronautics Board policy for regional and feeder lines into question, and has been the source of a legal battle reaching U. S. Supreme Court, whose decision in the case will affect all U. S. airlines.

▶ **Deep Basic Issues**—Immediate spark to the feud was a CAB decision last January ordering Western to suspend service to El Centro, Calif., and Yuma, Ariz., and awarding a certificate for a Phoenix-San Diego-Los Angeles feeder run to Bonanza. But basic issues in the case go much deeper than this hotly contested decision:

• **Will Bonanza and Southwest Airways** merge to put a strong regional competitor into the field against Western?

• **What will the Supreme Court** decide on Western's plea that the CAB action in the Imperial Valley case was not suspension but revocation of a permanent certificate and that CAB has no authority to revoke the certificate without just cause? Supreme Court also must determine whether property rights result from a permanent certificate and whether the Board's action in suspending Western amounts to seizure of property rights without compensation, a violation of the Fifth Amendment.

• **Has CAB adequately** defined the positions of feeder, regional and transcontinental lines?

Stakes in the battle are seen clearly in this gambling capital of the West, home of Bonanza Air Lines. Every issue in the case leads, directly or indirectly, back to McCarran Field and the big war-surplus metal hangar which is headquarters for the Route of the Gold Strikes. The situation calls for a detailed study of the little airline with four DC-3s invading territory Western long ago staked out as its own.

▶ **How Bonanza Started**—The start of Bonanza was inconspicuous. Edmund C. Converse returned from World War II with a record of four years in Navy intelligence and amphibious landing operations and a desire to start an airline. Unlike many veterans, Converse had money. He teamed up in Las Vegas with Charles Keene and June Simon, who had an airplane.

With Keene and Simon's four-passenger single-engine Cessna and $5,000 of Converse's money, Bonanza Airways began operating a charter service between Las Vegas and Reno. The company next leased a War Assets C-47 and started one roundtrip a week between the two Nevada cities.

Wallie Warren of Reno bought out Simon and Keene in 1946 and Florence Murphy also joined the group. The name was changed to Bonanza Air Lines.

More flights were added and in 1947 Bonanza decided to apply for a certificate. Wesley J. Durston, owner of a Los Angeles construction firm, joined the line as vice president and co-owner. He matched the $50,000 which Converse had invested by this time. In return, the owners had little to show but a great deal of experience in operating across Nevada's desert wastes and a great amount of red ink on the books.

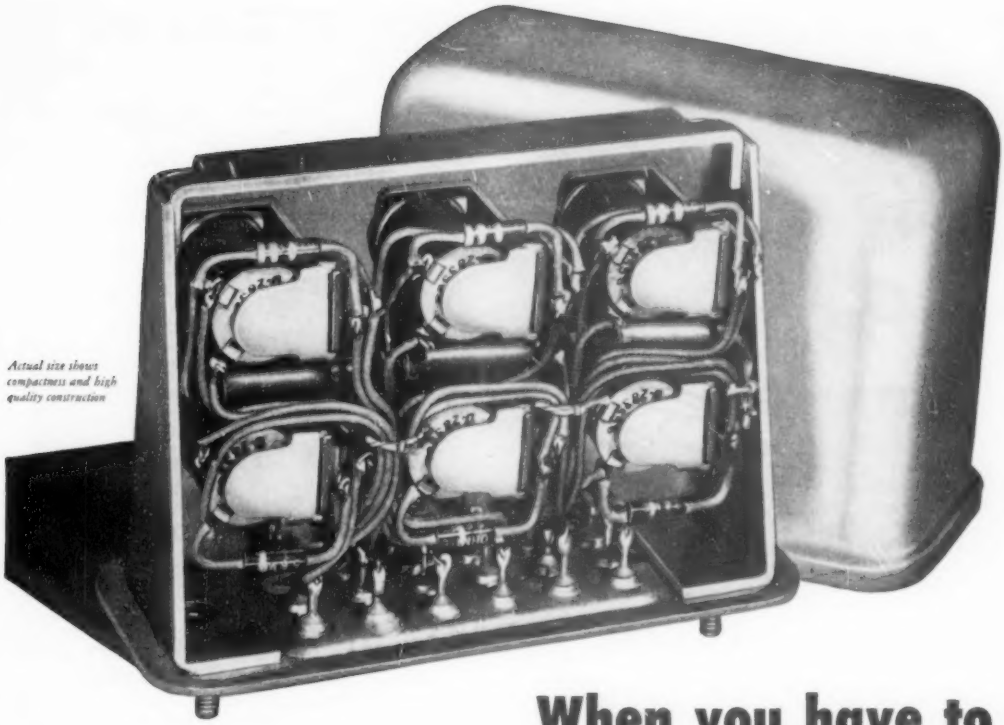
▶ **Bonanza Losses**—CAB awarded Bonanza a certificate in June 1949 for a Reno-Las Vegas-Phoenix route, on condition the newcomer buy TWA Route 38 between Las Vegas and Phoenix and make an additional showing of financial fitness before starting operations. Bonanza bought the route for roughly $600 and in November 1949 a three-year certificate was issued. The certificate expires at the end of this year.

From the time of its organization in 1945 until November 1949, Bonanza had lost roughly $220,000. The airline still is operating in the red. Converse has poured some $350,000 into it, Durston $270,000.

After receiving its interstate certificate, Bonanza purchased four DC-3s, two from United, one from Western and one from TWA. With these, the company set out to drum up trade along its barren route. Management expected the Las Vegas-Phoenix leg to be the least profitable segment. TWA had been operating one flight daily with a load factor approximating 20%. Bonanza soon was operating two flights daily with a 60% load factor.

Here lies one of the keys to Bonanza's success and to its popular acceptance in the area over which it operated before being awarded the Phoenix-San Diego-Los Angeles local service route.

▶ **Cities Feud**—For many years there was ill-feeling between Reno and Las Vegas, competing for gambling, marriage, divorce and tourist trade from



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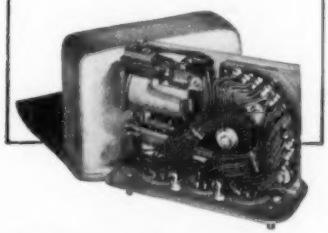

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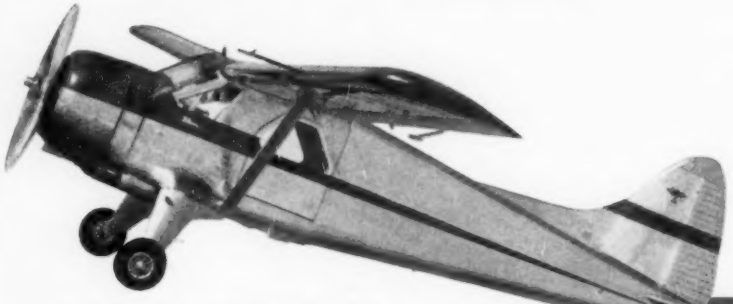

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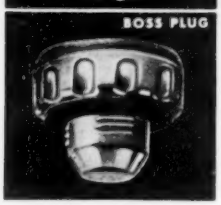

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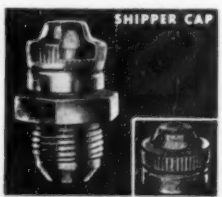

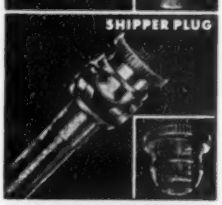

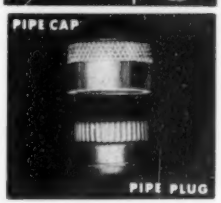

California and the East. Only a motor road linked the two cities. There was no north-south railroad and Las Vegas, tied to Los Angeles by air and rail, was more a part of the Southern California area than it was of its own state. Bonanza provided the much-needed link between Reno and Las Vegas and did much to break down intrastate prejudice. It encouraged junkets of businessmen and civic groups between the two cities.

The Reno and Las Vegas chambers of commerce, in an unprecedented action, voted $10,000 for a joint publicity and advertising campaign to stimulate air travel between the two cities. It paid handsome dividends for Bonanza.

▶ **Losses Drop**—The situation was similar when Bonanza began operations between Las Vegas and Phoenix. Close liaison by Bonanza with travel agencies, the chambers of commerce and business groups killed off a feud before it got well underway. Prejudice dropped and load factors climbed.

Losses dropped from $105,128 on the first year of interstate operation to $13,204 for 1951. Total loss for the first half of 1952 was $15,745 but much of this was due to the uncertainty and expense involved in the legal battle to get the new Phoenix-Los Angeles route operating. Although authorized to begin Los Angeles flights in January this year, Bonanza was unable to begin service until July due to the court fight with Western. Operating loss for the first half of 1952, which gives a more accurate picture, was only $169.30.

Bonanza soon realized that the answer was more mileage over which to spread its costs. Its 639-mi. feeder route between Reno and Phoenix was one of the shortest ever awarded by CAB. In 1950 Converse led his airline into the fight with Southwest, Frontier and Western for a feeder route between Phoenix and the Coast. He has been in legal trouble ever since.

▶ **Imperial Valley**—Historically, the Imperial Valley situation had been confused since CAB first agreed in 1943 to let Western serve the area. Western, after a wartime delay, began service in 1946. The Valley posed a tough operating problem for Western. Traffic was light and the route ran into a dead end at Yuma. Service to El Centro and Yuma started with two flights daily, dropped to one flight and finally settled down to three flights a week. Traffic dropped at El Centro from 591 passengers in September 1946 with two roundtrips daily, to 327 during March 1947 with one roundtrip daily, to 97 in September 1947 with three roundtrips weekly.

"The type of service Western provided El Centro and Yuma during 1947 to 1949 clearly did not meet the minimum requirements for adequate service," says CAB.

Throughout, Western has sought what seemed to be logical extension of this route across the 157 mi. between Yuma and Phoenix. For Western, it would provide not only a traffic-generating point for its Imperial Valley segment but would draw the Phoenix resort area into the company's "Skyway to Western Playgrounds." The extension was never granted.

"Good authority has it," says one Western advocate, "that American's fear of Western's parallel route was largely responsible for the refusal. American reportedly is politically hand in glove with the Administration."

▶ **Western Fears**—When CAB indicated dissatisfaction with Western's operation and hinted it might award the area to someone else, the airline resumed twice-daily flights to El Centro and Yuma from San Diego. Western, which at one point had considered giving up the El Centro and Yuma segment, now feared it also might lose its right to serve San Bernardino and the Palm Springs area.

In January 1950 the Board awarded a local service route through the area to Southwest. Western protested and two months later, before Southwest began operations, the Board reversed itself, rescinded the Southwest certificate and reopened the case.

Frontier had dropped out and the fight narrowed primarily to a battle between Bonanza and Western, although Southwest still sought to win back its prize.

On January 17 this year CAB announced its decision in the Reopened Additional California-Nevada Service Case. A certificate of public convenience and necessity was awarded to Bonanza between the coterminal points Los Angeles/Long Beach, Calif., and Phoenix, Ariz., via the intermediate points Santa Ana/Laguna Beach, Oceanside, San Diego, and El Centro, Calif., Yuma and Ajo, Ariz., and Blythe, Calif.

The Board "temporarily suspended" Western's authorization to serve El Centro and Yuma.

▶ **Legal Battle**—On February 18 Western obtained a court order staying the CAB decision and continued operating over the route. This legal battle tied up the award until June. On June 18 the Ninth Circuit Court of Appeals in San Francisco lifted the stay and further provided that no other stay would be issued.

Bonanza began operations over the route on July 15 and Western halted its flights to El Centro and Yuma three days later. Western has appealed to the Supreme Court.

At the outset, one of Bonanza's immediate problems was high maintenance cost. For the year ending June 30, 1952, direct maintenance of flight equipment ate up 21.73¢ per mi., while ground and indirect maintenance took 14.49¢ per mi. Projected costs for the amended certificate are 13.60¢ per mi. for direct maintenance and 8.29¢ for indirect.

▶ **Maintenance Costs**—Superintendent of Maintenance Ralph H. Allen blames past high maintenance costs on:

- **Rapid labor turnover** typical of a gambling and resort town such as Las Vegas.
- **Cost of standardizing** and modifying the four DC-3s to Bonanza requirements.
- **All four planes** had either 4,000- or 8,000-hr. checks due at the time Bonanza purchased them.
- **Necessity of farming out** engine overhaul.

The company's fleet was converted to 28-seat standard interiors in Bonanza's shops at a cost of $13,000 a ship. Bonanza does its own airframe overhauls and inspections, estimates it saved $14,000 on each 8,000-hr. overhaul.

Allen has set up a progressive overhaul system for heavy inspections such as No. 3, breaking it down into four major increments and often changing parts on daily inspections.

CAA has increased time requirement for No. 1 inspections from 50 to 60 hr., for No. 2 inspections from 150 to 180 hr. and for No. 3 from 250 to 300 hr.

Southwest Airways performs the engine overhauls on Bonanza's 20 Pratt & Whitney R1830-92s but Allen claims additional overhaul is necessary to bring the engines up to standard.

Bonanza modified the DC-3 vacuum system from a dual system to a single vacuum system to the manifolds. Allen says this has expedited trouble shooting and has cut service time in half or better. Cost per ship was $280.

Electrical system modifications cost $2,600 per ship. Bonanza also simplified and modified the hydraulic system and the instrument panel.

▶ **Innovations**—Communications Manager Roger Mohr has come up with several innovations of interest to other local carriers and even to larger airlines.

One is his so-called "Magic Lights" system. Bonanza, operating nonstop at night between Phoenix and Las Vegas, was paying a man to stand by at Kingman to turn the field lights on if an emergency landing became necessary.

Mohr devised a remote control system to turn the lights off and on from the aircraft, eliminating the necessity of a man on duty every night. CAA has okayed a test of the system and is interested in its possible standardization for use at emergency fields across the country.

The device will operate with a pulse

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radio signal on company frequency. Three clicks of the pilot's microphone button will turn the lights on before landing and five clicks will turn them off after takeoff. Range is 15-20 mi.

"It could operate on a dial system from the cockpit," Mohr explains, "but we have found that clicks of the microphone work just as well. It would be very rarely that static, ignition or otherwise, could run up to three evenly spaced pulses and turn the lights on unnecessarily. Five such static pulses would be almost an impossibility."

▶ **Telephones for Passengers**—Another innovation planned by Bonanza is installation of telephones for the convenience of passengers. Mohr realizes that the coastal portions of Bonanza's routes are within range of the ship-to-shore telephone station at San Pedro, Calif., during the daylight hours and that the entire route is within range at night. He found only slight modification necessary to adapt a ship-to-shore unit to airborne use.

One unit has been converted for experimental purposes. Bonanza has applied to Federal Communications Commission for a frequency and CAA has given the idea a tentative okay.

Whether these ideas ever reach operational use, the fact Bonanza is seriously discussing them indicates the line's fresh approach to some problems.

▶ **Looking to Future**—If Western's fight against Bonanza seems out of proportion to the route mileage involved, it is because Western, as well as Bonanza, is looking to the future. Western, now in a strong financial position and pouring money into advertising the resort areas of the West, sees a threat to its empire from rapidly growing Bonanza.

First, Western fears CAB may allow Bonanza to link its terminals at Los Angeles and Las Vegas with a direct route. Although Western now holds an exclusive franchise on the Los Angeles-Las Vegas route, CAB already has under advisement recommendations that the run be opened to competition. Bonanza would be cutting into a melon which brings Western $1,235,000 annually, 8% of the total system revenue. United and TWA also are interested in local service on the route.

▶ **Merger Discussed**—A second and more important Western fear is that Bonanza and Southwest Airways will merge. The two smaller airlines have been discussing such a move and CAB recommended an investigation into whether it was in the public interest at the time it awarded Bonanza the Phoenix-Los Angeles route.

The question may come before the Board again in December when Bonanza's temporary certificate comes up for renewal.

One need only look at an airline map to see what a potent competitor to Western a Southwest-Bonanza combination would be. If CAB allowed a link between Bonanza's northern Nevada terminal at Reno and Southwest's northern California operation, the damage to Western's tourist and local traffic would be even heavier.

▶ **Problems**—There are also some clouds on the Bonanza horizon:

• Possibility of a merger with Southwest, uncertainty over the Supreme Court decision and a small doubt over CAB action when the certificate comes up for renewal Dec. 31 have made management reluctant to plunge financially while in the throes of expansion.

• Bonanza must expand its advertising and publicity budget if it plans an effective battle against Western. Western's advertising budget for the year is almost as large a figure as Bonanza's total assets.

The Bonanza-Western feud also has emphasized the need for some serious CAB thinking on its philosophy regarding trunklines and local service carriers.

(Editor's Note: This is the first of two articles on the battle for the lush Pacific Coast resort air traffic.)

SHORTLINES

▶ **Air America**, nonsked airline, was strongly criticized for flying too much in violation of CAB regulations curbing nonsked business by CAB Enforcement Bureau, which recommended the line be put out of business.

▶ **American Airlines** officials hint of an important announcement on AA's jet transport plans to come soon.

▶ **Associated Aviation Underwriters** has installed international airline trip insurance vending machines at Boston's Logan Airport and at TWA-BOAC office in New York's Waldorf-Astoria—plans more soon for New York, Philadelphia, Miami, New Orleans, Houston, Los Angeles, San Francisco and Seattle. Rates generally are: 50 cents per $5,000 policy in Western Hemisphere, $1 Europe, $2 elsewhere.

▶ **Braniff Airways'** DC-4 accident of Mar. 26 at Hugoton, Kan., in which no one was hurt, was well-handled by the pilot, CAB investigation report says. Engine fire most likely started in zone 2—perhaps from rubbing of flexible oil pressure gauge line against positive terminal of the generator, CAB says.

▶ **Central Airlines** certificate renewal and route extension—once questionable—seemed assured at CAB's oral argument, with support of CAB examiner and bureau counsel, plus personal testimony of influential senators.

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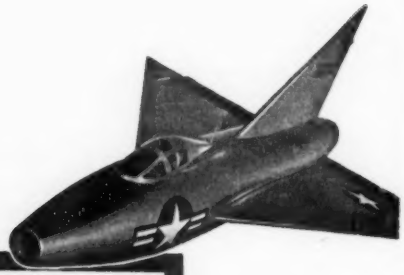

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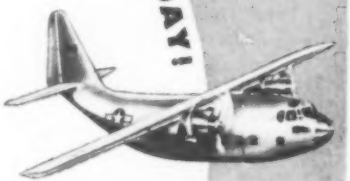

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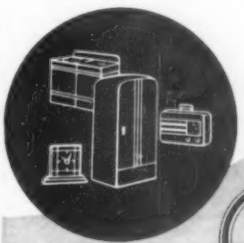

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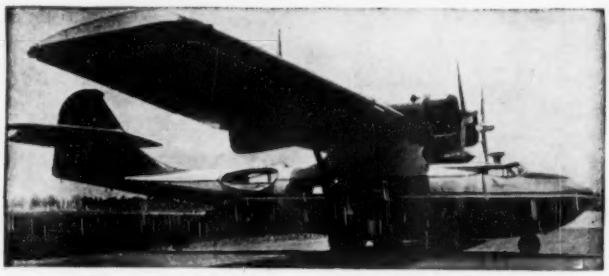

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11	14601-1F-B1	Eclipse	Gyro Indicator
71	828TY13Z2	Weston	Oil Temp Indicator
26	827TY14Z2	Weston	Cyl Head Temp Indicator
40	119868	Weston	Carb. Air Temp Indicator
10	15401-1	Eclipse	Amplifier (PB10)w/ED3 MOUNT
66	10078-1AG	Eclipse	Gyro Indicator
68	CQ-9	Eclipse	Clutch Switch (PB10)
20	12078-1	Eclipse	Amplifier (PB10)
57	MF45-3911-80Z	Vickers	Hydraulic Pump (3000PSI)
327	PF4-713-20BCE	Vickers	Hydraulic Pump
75	1416-19C	Eclipse	Starter
149	28008	Atkesearch	Jack (Cowl FLAP)
6	12011-1	Eclipse	Transmitter
85	3193-3A	Eclipse	Warning Unit
45	AN4103-8	Clifford	Brass (Valve AU4785) Oil Cooler
190	MF9-713-15A	Vickers	Hydraulic Pump
550	TFD 8600	Thompson	Fuel Booster Pump
125	D7818	Adel	Anti-Ice Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
1000	AN5780-2	G.E.	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
115	P4CA2A	Parker	Primer
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450	A-9 (94-32226)	Nasco	Ignition Switch
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188	EYLC-2334	Barber-Colman	Control
11	12086-1C	Eclipse	Amplifier
250	558-1A	Eclipse	Oil Separator
100	716-3A	Eclipse	Generator (NEA-3A)
89	318	Edwards	Horn
230	921-B	Stewart-Warner	Heater (200000 BTU)
97	6041H-146A	Cutler Hammer	Relay (B-12)
22	0655-D	Aro	Oxygen Regulator
65	ASDC2	CO_2 Mfg. Co.	Fire Detector
384	564-2A	Eclipse	Oil Seperator

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166	1045A	Bearing
500	3506	Flange
130	8288	Follower Ass'y
814	35814	Blower Ass'y
53	48362	Shaft
75	48363	Shaft
56	48398	Sump
390	48461	Gear
78	76236	Gear
1178	84289	Bearing
113	84487	Housing
77	84591C	Nose Housing
200	48350-D	Crankcase Ass'y
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200	84085	Cylinder

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407	SF9LN-2 (manufacturer's part No. 10-12453-6 Spec. AN9511)	Bendix Scintilla Magneto
42	SF5RN-12 (manufacturer's part No. 10-26170-1)	Bendix Scintilla Magneto
185,000	LS4AD1	Spark Plug (Aero)

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236	PR48-A1	Stromberg carburetor

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SO THEY TELL US

International

Official secrecy policies are preventing the British aircraft industry from obtaining data necessary to design atomic aircraft, David Keith-Lucas, chief designer of Short Bros. & Harland, complains. He says British aircraft designers were cut off from atomic research information at Britain's own Harwell research station.

The rapidly growing Canadian aircraft industry is siphoning off their technicians and skilled workmen, British aircraft executives tell AVIATION WEEK. Canadian firms have recruiting agents in London and British newspapers claim more than 1,000 Britons have migrated to Avro of Canada. There is a trickle of junior engineers flowing into the U.S. plane industry.

Problem of cross-servicing aircraft of various nationalities represented in NATO at fields where languages other than the pilots' own are spoken has been solved by the Allied Air Forces in Central Europe. Each pilot carries a card with all pertinent servicing queries printed together in both English and French. He points to the items he wishes.

Aviation people at Farnborough were asking delta test pilots if it's difficult to fly this new type. Avro says the best answer is its two men who flew the smaller Avro delta 707 research ships over the show in trio with the big bomber: Jimmy Orrell is 54 and Jimmy Nelson, an ex-RAF Eagle Squadron pilot, flies with a wooden leg.

Safety

Investigations by crash injury research of Cornell Medical College on making planes safer for occupants, in event of crash, have been so effective that leaders of the U. S. auto industry are interested in setting up a similar program to improve motor cars.

CAB up to a few days ago was still awaiting an answer from CAA on its letters of May and July asking action on recommended propeller reversal warning lights to be installed in commercial transport cockpits. CAA's Office of Aviation Safety is stalling.

Washington

Although it was to be an "expedited" case, CAB still hasn't defined the scope of the reopened trans-Atlantic airfreight case. Will it be a new case open to all applicants, or a hearing to admit new data only and limited to the three applicants now consolidated? Prehearing conference was held, but the examiner can do nothing till the Board decides these questions.

Pentagon circles say Air Secretary Finletter definitely expects to leave office Jan. 20, regardless of who wins the presidency. Undersecretary Gilpatric probably would take over the job in any interim period.

Assistant Secretary of the Navy Floberg plans to leave his post in December.

Washington reports indicate that Northwest Airlines' search for a new president involved discussions with Donald Nyrop and Del Rentzel, as well as with Pan American's Atlantic division vice president, Gen. Harold Harris. Croil Hunter, now president, has been slated for board chairman.

CAA Administrator Charles Horne has received a vigorously worded letter from the Eastern Queens Civic Council, fighting Queens airport noise, demanding removal of CAA regional administrator Ora Young. Young's part in anti-noise activity in Queens "is so little that he would have a difficult time to find an excuse to do less," Royal Dalrymple, council president, said.

Industry

Lockheed recently discovered Northwest Airlines was nearly set to buy DC-6s, without looking at the Super Constellations. It's now making a sales talk.

Press

Latest reports released by the Audit Bureau of Circulations for the six months to June 30 show average total paid circulation for American Aviation of 14,211; for Aero Digest, 27,097, and for AVIATION WEEK, 37,667. Only publications that sell their subscriptions can be audited by ABC. Aviation Age is a free circulation paper.

WHAT'S NEW

Telling the Market

A revision of the manual on magnesium products finishing systems, **Magnesium Finishing**, treats surface stability and surface treatment, including cleaning, mechanical finishing, chemical treatments, electroplating, painting, and assembly protection for magnesium alloy die castings, sand and permanent mold castings and sheet, extrusions and plate.

Aviation Materials Catalog is a 224-page listing which gives data on and illustrates hundreds of items made by more than 60 manufacturers used in components or on the assembly line. Covered are products used in production of radar, guided missiles, radio and communications equipment. Write on letterhead to Graybar Electric Co., 420 Lexington Ave., N. Y. 17.

Information on **precision 12-in. rotary table**, made of Sorbocast casting for greater strength, is contained in a brochure available from Kenco Mfg. Co., Los Angeles, Calif. . . . **The Effects of Copper Undercoating on the Protective Value of Nickel–Chromium Coatings on Steel** is a 12-page, illustrated booklet giving findings on an 18-month study including accelerated exposure tests and trials in various atmospheric conditions. **Modern Trends in Gear Materials–Part 1, Nickel, Steel and Cast Iron** (20 pages) and **Two New Gear Materials–Part 2** (11 pages) are aimed at the purchasers of replacement gears and for design and production engineers. These three publications are available from International Nickel Co., Inc., 67 Wall St., N. Y. 5.

Publications Received

- **Air Navigation Theory and Practice**, by E. Brook Williams & W. J. V. Branch, published by Pitman Publishing Corp., 2 W. 45 St., New York 19, N. Y., 1952. $12.50. Book covers fields of navigation magnetism, and flight planning; navigational instruments, radar and radio, D. R. navigation, astronomical navigation, tides, magnetism, and flight planning, photographs, drawings, charts.
- **Aluminum Forming Manual**, published by Reynolds Metal Co., Louisville 1, 1952. A manual of detailed information on how to form aluminum, with metallurgical data on aluminum sheet and plate and on tubing and pipe.
- **Writing the Technical Report**, by J. Raleigh Nelson, Third Edition, published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N. Y., 1952, $4.50. Book discusses design of the report, suggestions as to form and style, criticism, summary of basic principles, and manual for class use.

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EDITORIAL

The Public Must Be Served

Civil Aeronautics Board is holding another omnibus investigation of the potentialities of low-fare air transportation. It will run on for months; perhaps a year or more.

We hope all the facts come out. We think many have been glaringly apparent for several years, but the Board and some of the certificated carriers profess not to see them.

For example, one of the questions being asked by the inquisitors happens to be: Is there a need for air transportation services by the large irregular air carriers?

There would seem to be a ready-made answer to this one by looking at the periodic statistics CAB obtains from the irregular carriers themselves. The record has been well publicized for several years. However, the Board is using non-scheduled carrier traffic figures in its current inquiry that are already more than a year old—up to Sept. 30, 1951.

What has happened since?

According to latest figures on file with the Board, these large irregular carriers in the first half of 1952 took in revenues of $32,132,000. This was an increase of 28% from the $25,151,000 reported for the first six months of 1951.

The same carriers flew 598,068,000 revenue passenger miles in the first half of this year, for an increase of 53% over the 390,184,000 revenue passenger miles flown in the comparable period of 1951.

How about the latest 12-month period? In the fiscal year ended June 30, 1952, the irregular carriers report revenues of $66,841,000, a gain of 38% over the $48,525,000 taken in during the previous fiscal year. Revenue passenger miles in the latest recorded 12 months exceeded a billion! The exact figure was 1,290,634,000, or a 49% increase over 870,651,000.

Despite a strenuous publicity campaign waged against these carriers, they have been able to keep building an impressive business from scratch.

This record seems to answer the Board's question rather convincingly—is there a need for air transportation services by the large irregulars?

Furthermore, the need appears to be growing the longer that CAB "studies" the matter, and the longer the major certificated transcontinentals fail to win over or put a dent in the nonskeds' traffic.

It should be noted that certificated airline passenger business too has been increasing during the irregulars' big revenue gains, and this is true for both scheduled coach and full-fare service. The old charge that the irregulars divert business from the skeds is much more difficult to prove than the irregulars' contention that they are creating new business for all air carriers.

It also seems difficult to prove the certificated carriers' claim that they are now meeting adequately the public's need for inexpensive air transportation. A billion passenger miles sold by competitors in a year is impressive evidence for the competitors.

So is the recent information that one scheduled carrier keeps you waiting four weeks for its transcontinental air-coach flights. This is several times slower than a coast-to-coast train ride!

One important point should be made, we think: This is not really a matter of "skeds" versus "nonskeds" at all. It is primarily a matter of encouraging and meeting the public's demand for air transportation. Any segment of aviation—whatever it is—that does less than its best on this score is negligent and unprogressive. And any aviation group that can sell a billion passenger miles a year must be meeting a need that the public does not find elsewhere. The public must be served; it will be served.

Appalling Blunder

There is no more security-minded group in our Air Force than the Strategic Air Command. Extreme measures are taken at its bases to preserve security. There is some Air Force opinion that SAC overdoes it a bit.

The average American, however, is not likely to complain, even on those infrequent occasions when he encounters these super-strict regulations. He feels it's all meant for his protection.

But many illusions were shattered and many of us were amazed the other day at the result of a tornado that ripped through Carswell Air Force Base at Fort Worth and the Convair plant area a short distance away.

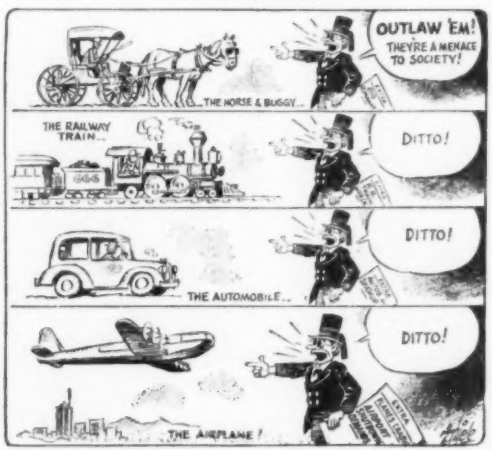
The storm damaged 106 of our B-36s, the super-bomber described by the Air Force for years as our first means of retaliating for a Russian attack on the United States.

The quick repair of most of the bombers, announced by the Air Force, hardly offsets the public's dismay that so many of our biggest bombers were allowed to be concentrated in one area.

It was an appalling error. Someone in security-minded SAC failed us where security counted most.

—Robert H. Wood

THE PATH OF PROGRESS



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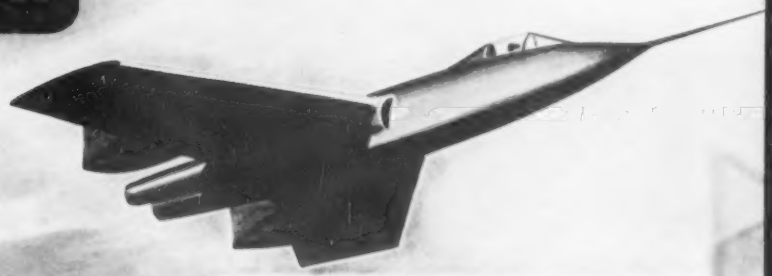

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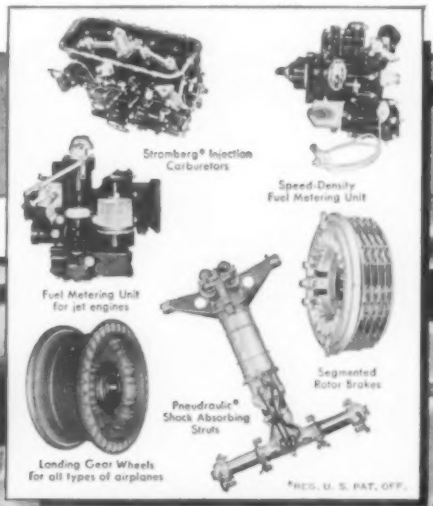
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on the Pratt & Whitney Turbo-Wasp

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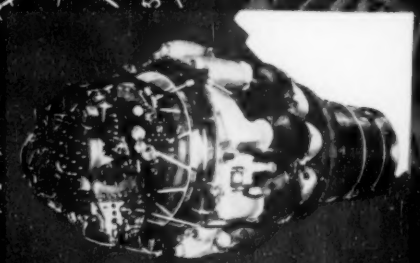

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